

Who Destabilized the Korean Stock Market?*

by

Yung Chul Park**

and

Innwon Park***

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** Professor, Department of Economics, Korea University (ycpark@soback.kornet21.net).

*** Associate Professor, Graduate School of International Studies, Korea University (iwpark@kuccnx.korea.ac.kr).

I. Introduction

A number of recent empirical studies provide some evidence that foreign portfolio investors in emerging financial markets have been engaged in positive feedback trading: buying when the market is booming and selling when it is slumping. These same studies suggest that foreign investors exhibit herd behavior. This behavior set, regardless of its rationality, could have deepened the crisis in East Asia and might have rendered justification for controlling capital inflows in emerging market economies.

The available evidence, however, is not conclusive. Positive feedback trading itself does not necessarily mean that foreign portfolio investors were destabilizing or increasing the volatility of the market.¹ Furthermore, none of these studies provide credible reasons as to why foreign portfolio investors practice such trading activities. It is sometimes argued that foreign investors do not have as much information as domestic investors do on economic fundamentals and market development, but this “information asymmetry” explanation is not satisfactory. Foreign portfolio investors, in particular institutional ones, employ local agents or brokerage houses to gather and analyze market related information. In recent years, they have had access to all sorts of information on the market and the economy by financial and research institutions. A lack of information has not been a serious problem for foreign portfolio investors in most emerging markets. In fact, many domestic investors believe that foreign investors in general have a better ability to analyze the available information and have predicted better market movements. Given this perception, it would not be surprising to find that domestic investors closely mimic the portfolio decisions of foreign investors at least in some emerging markets.

¹ If the positive feedback trading is a rational response to the market signal, the foreign investors’ rational behavior will enhance the market efficiency and reduce the possibility of sudden change in the market.

De Long, Shleifer, Summers, and Waldman (1990) develop a theoretical model in which rational investors are shown to follow positive feedback trading and their rational speculation destabilizes prices. Tesar and Werner (1993, 1995), Bohn and Tesar (1996), and Brennan and Cao (1997) provide evidence for a positive correlation between international portfolio investment inflows and the dollar rate of returns on stocks. Froot, O'Connell, and Seasholes (1998) also examine the relationship between international portfolio flows and the stock returns of emerging stock markets. They find both that international inflows have some ability to forecast returns in emerging markets and also that stock prices may rise subsequent to the inflows for a long period of time.

There are a number of studies examining foreign investors' trading behavior in emerging stock markets. Among them, Bekaert and Harvey (1995) analyze stock market volatility in emerging capital markets, including that of Korea. However, this study covers the period before the crisis, when the Korean market was not fully opened to foreign investors. Moreover, their work is directed to finding common world factors, which may explain volatility by a cross-country comparison, rather than focusing on the behavior of foreign investors in individual country markets.

Choe, Kho, and Stulz (1998) and Kim and Wei (1999) are the first serious attempts to examine whether the trading patterns of foreign portfolio investors destabilized the Korean stock market in the late 1990s by engaging in positive feedback trading and herding. These studies attempt to gauge the impact of foreign investors' trading on the Korean stock returns using trading data on the Korea Stock Exchange (KSE). Using foreign investors' trading data on the KSE, they estimate several ratios to find whether foreign investors follow positive feedback strategies and whether they herd. Choe, Kho, and Stulz (1998) find evidence of positive feedback trading and herding by foreign investors but no evidence of a destabilizing effect during the period before the crisis and the last three months of 1997. However, their

study fails to explain foreign investors' behavior after the crisis and does not answer the question of who destabilized the market, if foreign investors were not responsible. Kim and Wei (1999) improve and update information on trade data on the KSE. They find strong evidence of positive feedback trading and herding by foreign investors before, during, and after the crisis, but fail to explain whether foreign investors were largely accountable for destabilizing the market.

Most of the earlier studies are incomplete in that they do not compare the behavior of foreign investors with that of domestic investors. The trading share of foreign investors in the Korean stock market before the crisis was only 6%. Could such a small segment of the market participants alone destabilize the market and bring about the crash? If foreign investors as a whole followed positive feedback trading, it follows that domestic investors as a whole were engaged in negative feedback trading. Therefore, if the positive feedback trading by foreign investors destabilized the market, then the negative feedback trading by domestic investors should have tended to stabilize the market. On the other hand, if their positive feedback trading was a rational response to the market signal, the negative feedback trading by domestic investors was an irrational response to the signal and would increase market inefficiency and instability. In order to understand the role of foreign investors in the Korean stock market, one must consider the behavior of domestic investors as well. Otherwise, the *ex post facto* data analysis may not convey any significant information on the extent to which foreign portfolio investors contributed to market instability.

In this study, we use more updated data sets including that of the period after the crisis in order to examine the trading patterns of all investors in the Korean stock market and determine which investor group should be held responsible for the increase in market instability. First, we analyze the monthly data set using a methodology similar to the one chosen by Kim and Wei (1999) and Lakonishok, Shleifer, and Vishny (1992) to determine

whether foreign investors follow positive feedback trading in the Korean stock market. Second, we run a Vector Autoregressive Regression (VAR) estimation to analyze the relationship between investors' behaviors and the market return. This estimation is compared with a Granger causality test using the daily record of stock trade in the KSE. Finally, we construct a GARCH model to find out whose trading activities contributed to the increase in volatility in the Korean stock prices.

This paper is organized as follows. We briefly explain the data sets we use in Section II. In Section III, we introduce the methodologies adopted to examine investors' trading patterns in and their impact on the Korean stock market. Section IV discusses the results of the Granger causality test and the VAR estimation for a possible linkage between investors' portfolio decisions and the market return. The GARCH model is also estimated to evaluate the likely effects of investors' portfolio decisions on the volatility of the stock rate of return in the KSE. Section V summarizes our findings. The Appendix briefly explains the important role of indirect foreign capital flows through domestic financial institutions during the late 1997 period as a main cause of the Korean currency crisis.

II. Data

This study uses two data sets. The first is the monthly data set, which is used for an analysis of feedback trading of investors by country of origin and type (individual or institutional investor). The second is the daily data set for an analysis of changes in the volatility of the Korean stock market returns and the sources of that volatility.

II-1. Monthly Data Set for Feedback Trading²

² Korea Securities Computer Corporation (KOSCOM) kindly provided this data set.

This data set includes two subsets, one for stocks traded and another for foreign investors' trading records in the Korean stock market. The monthly data set spans from December 1996 to April 1999. The stock data set contains information on code number, industrial specification, month-end price, month-end number of shares outstanding, monthly transaction volume, and whether or not the investment ceiling was binding in that month.

The data set for foreign investors contains information on month-end shareholding for each stock listed in the KSE and on whether or not the investment ceiling was binding for that investor in that month. Investors are identified by 4digit ID codes—the first digit for nationality, the second digit for the residential classification, the third digit for the individual-institutional breakdown, and the last digit for the classification of investors by their trading volumes. For the last digit, we divide independent investors from the same country into 10 different groups according to the size of outstanding shares in June 1997. Because of this grouping, the data set for investors used for this study contains trading behavior of 10 groups from each country rather than those of independent investors from each country. This is a weakness of the data set, but we were not able to collect better data because of the strict regulation on the reporting of stock trading information under the “Real Name Financial System.” The Korea Financial Supervisory Committee (KFSC) does not permit publishing the history of an individual investor's trading activity, even with a randomly assigned ID code.³

In general, this data set is similar to that used by Kim and Wei (1999), but it is longer, covering until June 1998, when the stock market had not yet recovered from the crisis. By updating the sample period, we can examine trading patterns of foreign investors in the

³ This limitation will not be a big problem for study of the feedback trading of foreign investors in the KSE, but it will not be adequate in evaluating their herding behavior. This is the reason why we do not analyze the herding behavior. In addition to the feedback trading analysis, we add VAR analysis by using the daily data set to increase our confidence in the results.

market after the Korean financial crisis. Moreover, by identifying foreign investors by country of origin, we may discover differences in trading patterns by nationality.

Certain categories of observations on investors and stock-months are excluded to avoid biased information and the outlier problem. They are: (i) stocks that were not listed in December 1996, (ii) investors who were not registered for the whole period, (iii) stocks that have reached foreign ownership limits, (iv) stocks that are not initially owned by any foreign investors, and (v) stock-months with too high and too low dollar rates of return. For the month-end exchange rate of the Korean won against the US dollar, we use the IMF data.

II-2. Daily Data Set for Causality between Investors and Market Return⁴

The daily data set includes the Korea Composite Stock Price Index (KOSPI) and information on the daily transaction volumes and values of listed stocks bought and sold by domestic investors and foreign investors. The domestic investors are divided into 8 subgroups such as (i) Stock Companies, (ii) Insurance Companies, (iii) Investment Trust Companies, (iv) Banks, (v) Merchant Bank and Savings & Finance Companies, (vi) Mutual Aid Funds, (vii) Government Funded Institutions, and (viii) Individual. The data set runs from November 30, 1996 to April 30, 1999.

III. Methodology

III-1. Feedback Trading

As the first attempt to find whether foreign investors could be identified as the group destabilizing the Korean stock market, we analyze, following the methodology used by Kim

and Wei (1999) and Lakonishok, Shlifer, and Vishny (1992), the relationship between portfolio decisions by foreign investors and the dollar rate of return on the listed stocks in the KSE.

For a given period, we divide all the observations on stock-months into five groups of approximately the same size, from the best performing portfolio (highest 20%) to the worst performing portfolio (lowest 20%), by the previous month dollar rate of returns on the stocks. The dollar rate of return on stock i from month $t-1$ to t is defined as:

$$[\ln P_{i,t} - \ln P_{i,t-1}] - [\ln KOSPI_t - \ln KOSPI_{t-1}] - [\ln e_t - \ln e_{t-1}]$$

where $P_{i,t}$, $KOSPI_t$, and e_t are the price of stock i , KOSPI index, and the exchange rate of the Korean won against the US dollar.

For the analysis of foreign investors' trading patterns, we use three measures of investors' portfolio decisions in a given period: Sratio, Dratio, and Nratio. The Sratio measures scale-adjusted net buys of shares in number, the Dratio measures scale-adjusted net buys of shares in the dollar value, and the Nratio measures the buyers' ratio. These ratios are defined as:

$$S - ratio = \frac{\text{Number of Shares Bought} - \text{Number of Shares Sold}}{\text{Number of Shares Bought} + \text{Number of Shares Sold}}$$

$$D - ratio = \frac{\text{Dollar Value of Shares Bought} - \text{Dollar Value of Shares Sold}}{\text{Dollar Value of Shares Bought} + \text{Dollar Value of Shares Sold}}$$

$$N - ratio = \frac{\text{Number of Buyers}}{\text{Number of Buyers} + \text{Number of Sellers}}$$

For each and every category of stock-months, we estimate the average performance of

⁴ Korea Stock Exchange (KSE) kindly provided this data set.

foreign investors. If the differences between the mean of the best performing portfolio and that of the worst performing portfolio based on the S-, D-, and N-ratios are positive (negative) and statistically significant, we may conclude that foreign investors are positive (negative, respectively) feedback traders.

III-2. Causality Test

A set of Granger Causality tests is run to examine whether the behavior of a particular investor group leads to changes in Korean stock prices or is passive in that the group responds to price changes with lags. In doing so, we may learn whether investors respond to market changes in a rational manner or whether they destabilize the market.

III-3. VAR Analysis

The ratio analysis in the previous section may reveal investors' responses to changes in the market return, but does not explain the causality between them. The Granger test helps determine causality but not the pattern of response. In order to find the pattern of investors' responses to the market signal and the effect of investor's portfolio decisions on the market return, we conduct a VAR estimation using the daily data set. By analyzing the response pattern, we may be able to determine whether a particular investor group is a positive or negative feedback trader. In addition, we may also be able to evaluate whose portfolio decisions most affects the market return.

Suppose that the net buys of Korean stocks by an investor group and the rate of return that is calculated from change in KOSPI⁵ are jointly determined by a two variable VAR with

⁵ For foreign investors, changes in exchange rate will be considered to changes in the KOSPI to calculate the dollar rate of return.

a constant as follows:

$$X_t = C + A(L) X_t + e_t \quad t=1,2,3, \dots, n$$

$$A(L) = \sum_i^p A_i L^{i-1}$$

where X_t is a vector of the above -mentioned two endogenous variables, L is a lag operator, and C is a constant.

By estimating the model and analyzing impulse responses, the causal relationship between the portfolio decision by a particular investor group and the rate of return on stocks will be evaluated. Prior to estimating the VAR model, we will perform a unit root test to check whether the two variables are stationary.

III-4. GARCH Model for Volatility Test

We first go through raw data to determine the periods in which sudden changes in volatility of the Korean stock market returns (R_t) occur and then estimate a GARCH model with periodic dummies to measure the variance of those sudden changes. Similar to Aggarwal, Inclan, and Leal (1999), which examines volatility in emerging stock markets by using GARCH(1,1) with dummies, we construct the following GARCH model with dummies. In addition to dummy variables, we include one more exogenous variable to gauge the effect of net buys by different groups of investors on changes in volatility.

$$R_t = a_0 + b_i \sum_i R_{t-i} + c_i Y_t + d_t D + e_t$$

$$h_t = w_0 + w_1 Y_t^2 + w_2 D + \sum_i a_i e_{t-i}^2 + \sum_i b_i h_{t-i}$$

where R_t is the rate of return on the listed stocks in the KSE, Y_t is the value of net buys by particular investor group, D s are dummy variables for periodic specification, and h is the conditional variance.

The first equation is the mean equation, which is a function of own lagged variables (R_{t-i}), an exogenous variable (Y_t), dummies (D), and an error term (e_t). The second equation is a function of five terms—(i) the mean w , (ii) square of net buys⁶ Y^2 , (iii) dummies D , (iv) news about volatility from the past periods measured by the lagged squared residual from the mean equation e^2 (the ARCH term), and (v) past periods' forecast variance h (the GARCH term). The first equation may tell us whether the net buys by a particular investors group and dummies explain the average change in the return. The result from the second equation may indicate whether variations of net buys by a particular investor group explain the volatility of the market return.

IV. Empirical Results

We divide the whole period into three sub-periods: before, during, and after the crisis. The period before the crisis spans from November 30, 1996 to October 23, 1997 (December 1996 to October 1997) when the Hong Kong stock market crashed, the crisis period runs from October 24, 1997 to September 3, 1998 (November 1997 to September 1998) when the Korean government announced the restructuring of the big five industrial groups (Chaebols), and the period after the crisis is from September 4, 1998 to April 30, 1999 (October 1998 to

⁶ For the variance equation, we use the square of the excess demand for stocks because the net buys have both positive and negative signs over time and changes in either direction will equally affect the

April 1999 for the monthly data set, respectively).

IV-1. Descriptive Statistics

Table 1 summarizes the descriptive statistics of key variables in the Korean stock market. These statistics are reported for the daily stock index, exchange rate and its changes, and the dollar and local rate of returns over time. The KOSPI plunged to an all-time low and the exchange rate depreciated almost 100 percent when the crisis broke out but since then have returned to a normal level as illustrated in Figure 1. These changes contributed to the negative dollar rate of return on the listed Korean stocks during the crisis period.

In Table 2, Figure 2A, and Figure 2B, which depict investors' portfolio decisions over time, we observe that foreign investors, domestic investment trust companies, and domestic individual investors were in general net buyers and others were net sellers for the whole period. In particular, foreign investors were net sellers during the early stage of the crisis but then returned to the market and actively increased their shares, as illustrated in Figure 2A. In contrast, domestic individual investors initially increased their shares, reduced their holdings shortly after the crisis and then returned to the market. Most domestic institutional investors reduced their shares for the whole period. The quick recovery of the market after the crisis was achieved through a sharp increase in the demand by foreigner investors and domestic investment trust companies.

Did the net sells by foreign investors from late October through early November in 1997 trigger the crisis by leading to net sells by domestic investors? In order to check whether domestic investors deepened the crisis by following foreign investors' trading pattern at that time, we zoom up the trading patterns during the early stage of the crisis in

Figure 2B, which illustrates that foreign investors, domestic investment trust companies, and domestic merchant, savings & finance companies all show a similar trading pattern. However, we could not find a causal relationship among those three investor groups during the early stage of the crisis.

As illustrated in Figure 3, the total transaction share of foreign investors in the Korean stock market during the crisis period was higher than their overall average. This was the result of the abnormally high share of net buys by foreign investors during the crisis period (see Figure 2) due in part to the rapid upward adjustment of foreign ownership limits (see Table 3) and the recovery of international confidence in the Korean economy. The buy and sell shares of investor groups are summarized in Table 4.

IV-2. Feedback Trading

Three different ratios are estimated to see whether foreign investors follow positive feedback trading in the Korean stock market. Tables 5, 6, 7, and 8 summarize the results from the ratio analysis for the feedback trading by foreign investors for the whole period, and before, during, and after the crisis, respectively. The tables report differences between the mean of the best performing portfolio (highest 20%) and that of the worst performing portfolio (lowest 20%) with t -values based on the S-Ratio, D-Ratio, and N-Ratio. The classification of portfolio performance is determined by the previous month's dollar rate of return on each stock in the market.

For the whole period in Table 5, we find strong evidence of positive feedback trading by all groups of foreign investors, with the exception of the individual investor groups. In particular, all three ratios of British, German, and other foreign individual investors indicate that they follow negative feedback trading, although the t -values of the ratios are not

significant.

From Table 6, we see that foreign institutional investors and most of the individual investors from the UK, Japan, Germany, and America were negative feedback traders in the Korean stock market before the crisis, but once again the ratios are not statistically significant. During the crisis period, the negative feedback trading of foreign investors became more pronounced, with the statistically significant t-values of the ratios. Foreign investors, irrespective of their nationality, bought winners and sold losers during the crisis (see Table 7).

For the period after the crisis, we do not find any consistent result from our ratio analysis. Whether foreign investors follow positive feedback trading or not depends on the methodology we choose. Our results are only partially consistent with those of Kim and Wei (1998). We find that foreign investors were positive feedback traders during the crisis period, but were not during the period both before and after the crisis.

IV-3. Investors' Portfolio Decision and Market Return

If average foreign investors bought winners and sold losers during the crisis period, it then follows that average domestic investors must sell winners and buy losers, because there are only two groups of investors. The positive feedback trading by foreign investors implies a causal relation in which foreign investors' net buys are influenced by change in the rate of return on stocks. The evidence of positive feedback trading in terms of the three ratios does not prove that the engagement of a particular investor group in positive feedback trading necessarily increases stock prices or market volatility. In order to test a causal linkage between stock prices and investors' excess demand for stock measured by net buys, we therefore turn to the Granger causality test and the VAR estimation in this section.

IV-3-1. Causality Test

From the Granger causality tests summarized in Table 9, we find that both average foreign and domestic investors respond to changes in the rate of return on the listed stocks in the Korean stock market. On the other hand, changes in stock prices are not significantly affected by the excess demand by either foreign or domestic investors. However, during the crisis, we find that net buys for stocks by domestic investors had a significant effect on the rate of return on stocks (at the 5% level of significance). This means that the dramatic fall in the Korean stock prices during the crisis period was caused largely by domestic investors, not foreign. This result is consistent with the evidence that domestic investors were net sellers during the crisis period.

When we divide domestic investors into eight different groups, the causal relationship between investors' portfolio decisions and the market price varies over time. During the period before the crisis, only domestic insurance companies and individual investors responded to the market return, and their response in turn led to changes in stock prices. However, during the crisis period, the excess demand for stocks by insurance companies, investment trust companies, mutual aid funds, and individual investors brought about changes in stock prices. This pattern of behavior destabilized the market at the time of the crisis. This causal linkage between domestic investor groups' trading and the market became insignificant after the crisis.

IV-3-2. VAR Analysis

In order to substantiate further the Granger causality test, we also estimate the impulse response of net buys to the rate of return in terms of a two-variable VAR equation—the net

buys of the Korean stocks by a particular investor group and the dollar rate of return. Prior to estimating the VAR model for causality, we perform a unit root test to check whether the two variables are stationary. Table 10 indicates that they are stationary.

For a test of optimal lags in the VAR equation, we use the Akaike Information Criterion (AIC) and the Schwarz Criterion (SC). In our test, we do not find any significant differences in VAR equations with different lags from 1 to 5. We therefore arbitrarily include five lags in the VAR equation.

The VAR model is then used to estimate impulse responses. Figures 4 and 5 represent changing patterns of the impulse response of the net buys by foreign as well as domestic investors to the rate of return for the four different periods. The impulse response patterns show that foreign investors are positive feedback traders while domestic investors are negative feedback traders for all the periods, but statistically this pattern of trading is less significant during the period before the crisis than during other periods. This finding confirms the earlier results we obtained from the ratio analysis.

The impulse responses of the rate of return to the net buys by both foreign and domestic investors are not significant at the 5% level, when the period after the crisis is excluded. For the period after the crisis, the net buys by foreign investors immediately raise the dollar rate of return. This effect disappeared rather quickly, however.

In summary, the VAR experiments with the daily data support our earlier findings on the positive feedback trading by foreign investors in the Korean stock market. For the domestic investors, their trading pattern is a mirror image of that of the foreign investors. One interesting finding from the impulse response pattern in Figures 4 and 5 is that the causal linkage between net buys and the rate of return for both foreign and domestic investors has been getting more sensitive and significant over time, especially during the period after the crisis. This development may be related to liberalization of the domestic financial market

and the recovery of global capital movements.

Figures from 1 to 8 in Appendix illustrate the impulse response patterns of eight different domestic investor groups, and Table 11 summarizes the immediate impulse responses together with the results from the Granger causality test. Overall, foreign investors positively responded to the price change. In contrast, banks, merchant banks, savings and finance companies, and individual investors in Korea respond negatively to the change. On the other hand, net buys by securities firms and investment trust companies increase the market price, but net buys by merchant banks, savings and finance companies, and government funded institutions have negative effect on the price.

Before the crisis, insurance companies and individual investors negatively responded to price changes, and net buys by individual investors caused a significant increase in the price, but this positive effect did not last long and the largest fall in the price followed. During the crisis period, all of the domestic investors followed negative feedback trading in contrast to the positive feedback trading by foreign investors. Net buys by banks and government-funded institutions decreased the price, whereas those by investment trust companies raised the price. After the crisis, foreign investors bought winners and sold losers, but domestic individual investors moved in the opposite direction. In general, the stock price is pushed up by foreign investors' purchases and pulled down by domestic individual investors' net buys.

The impulse responses, especially during the crisis period, show that most domestic investors, especially domestic individual investors, reacted sharply to the price changes and that their trading behavior was the main source of market turmoil, which in the end contributed to the market crash at that time of the crisis.

IV-4. GARCH Model for Volatility Test

As we can see from Figure 5, the volatility of the Korean stock returns has increased since the crisis. In this section, we attempt to explain the factors behind the extremely high volatility during the crisis period and after by estimating a GARCH model. The mean equation of GARCH (1,1) for the rate of return includes a constant, own lagged variables, exogenous variables including two dummies for the periods during and after the crisis, investors' excess demand for Korean stocks, and an error term. The conditional variance equation of the model includes a constant, exogenous variables (dummies and square of the excess demand by investors), news about volatility from the past periods measured by the lagged squared residuals from the mean equation (the ARCH term), and past periods' forecast variance (the GARCH term).

In the GARCH (1,1) model estimation, the ARCH and GARCH coefficients are both significant in equations from 1 to 8 (see Table 12). In most of the equations, the sum of the ARCH and GARCH coefficients is very close to one, indicating that volatility shocks are quite persistent. This means that the disturbance of the Korean stock prices is a linear function of one lagged squared disturbance and one lagged conditional variance.

This result is also supported by equations 2, 3, and 4, which include dummies to the GARCH model. The values of the GARCH coefficients are reduced when the dummies are included. However, the value of log likelihood without dummies (Equation 1) is higher than that with dummies (Equations 2, 3, and 4). This suggests that the model without dummies is more suitable, even though dummy variables are statistically significant for explaining the high volatility since the crisis.

In equations 5, 6, 7, and 8, the net buys by foreign investors explain the changes in the rate of return, but the conditional variance is not statistically significant. This means that the excess demand by foreign investors affects the rate of return but does not explain the increased volatility. Foreign investors do not appear to have destabilized stock prices during

the crisis.

In order to identify the groups that did, we perform the GARCH (1,1) estimation for different groups of domestic investors and find results similar to those of foreign investors. One significant finding is that the stabilizing effect of the trading by domestic investment trust companies is relatively strong at the 10% level of significance (see Table 12).

V. Concluding Remarks

Who destabilized the Korean stock market? We carried out a number of empirical tests to find an answer to this question. Our tests confirm some, but not all, of the earlier findings.⁷ From our experiments, we find that foreign investors generally followed positive feedback trading, during the crisis period, but we do not find any evidence that this destabilized the Korean stock market⁸.

From our historical data set, it can be seen that foreign investors actively increased their holdings of Korean stocks even during the crisis period, although they were net sellers immediately after the crisis occurred. In contrast, most of domestic institutional and individual investors reduced their shareholdings after the crisis broke out. Interestingly, domestic individual investors' responses to the market change were quite passive and perhaps irrational. When foreign investors and most of the domestic institutional investors left the market right after the crisis touched off, individual investors stayed on and increased their stock holdings. Similarly, when foreign investors and domestic investment trust companies returned to the market after the market stability was restored, individual investors reduced their stock holdings and only gradually returned to the market.

We examined the effects of different investors' portfolio decisions on the volatility of

⁷ For example, De Long, Shleifer, Summers, and Waldman (1990), Tesar and Werner (1993, 1995),

the Korean stock return. The simple data analyses based on S-ratio, D-ratio, and N-ratio show that foreign investors followed positive feedback trading during the crisis period. However, before the crisis, there is no strong evidence of positive feedback trading by foreign investors. Their trading behavior after the crisis is unclear, however. This finding is partly consistent with, but does not support the results of, other studies discussed in Section I.

The Granger causality test and the VAR analysis also confirm the positive feedback trading by foreign investors and the negative feedback trading by most of the domestic investors. Both foreign and domestic investors have become more sensitive to changes in the market return after the crisis, contrary to what the ratio analysis suggests. However, the causality tests reveal that foreign investors did not have enough mass to change the market price, but domestic investment trust companies and individual investors did, especially during the crisis period. This means that net sells by those two domestic investor groups exacerbated the crisis. We also find that the portfolio decision by any particular investor group cannot affect the market price after the crisis. This development may be related to efficiency gains from enhanced competition since opening the market. The VAR analysis also supports the view that domestic individual investor groups in particular exhibit a rather passive and irrational trading behavior.

The results from the VAR impulse response estimation and the GARCH analysis suggest that the net buys by both foreign and domestic investors excluding insurance companies, merchant banks, and savings and finance companies affect the mean of the market return, but none of the investors groups can explain the increase in market volatility. These findings indicate that foreign investors rationally responded to information on the economic fundamental available rather than overreacted to disturbing factors in the market even during the crisis period. Since foreign investors account for a small share of trading,

Bohn and Tesar (1996), Brennan and Cao (1997), and Kim and Wei (1999).

less than 7% for the whole period, our results are not surprising.

We also find from the experiment with the GARCH model that high volatility is quite persistent since the crisis occurred. What does then explain the increased volatility of the rate of return on the Korean stocks? Based on the result from the Granger causality test and the VAR estimation, we conclude that domestic investors, especially individual investors, were the major source of the increased volatility. However, they are not solely responsible. Further research on trading patterns of domestic individual investors with disaggregated trade data may give us a better clue.

One more interesting finding from the impulse response estimation is that net buys and the rate of return on local stocks have become more sensitive to each other since the crisis occurred. The increased sensitivity is related to capital market liberalization through the relaxation of regulations and the abolishment of foreign ownership limit, which has in turn improved the competitiveness and efficiency of the Korean stock market.

⁸ Choe, Kho, and Stulz (1998) also indicate this fact.

Appendix

If the foreign portfolio investors did not trigger the Korean currency crisis as we analyzed in this study, who did? Appendix Table 1-1 clearly shows that 10.9 billion US dollars of huge capital outflows at the end of 1997 were mainly caused by the dramatic fall in the short-term foreign loans to domestic deposit money banks. In 1997, the Korean capital and financial account recorded 1.3 billion US dollars of net capital inflows but the net short-term foreign loans to deposit money banks and other sectors at that time were -30 billion US dollars, or 23 times bigger than the overall net capital inflows. The short-term capital outflows from deposit money banks were concentrated on November and December in 1997. The short-term capital outflows just before the crisis triggered the shortage of foreign exchange in the Korean banking sector. However, most of the capital outflows in 1997 were offset by the long-term foreign loans and portfolio investment, especially to buy debt securities. The reversal of capital account from positive in 1997 to negative in 1998 was deepened by the portfolio investment outflow not by net sells of equity securities but by net sells of debt securities after the crisis. These figures also support our earlier findings in main text.

We divide the capital and financial account of Appendix Table 1-1 into Appendix Table 1-2 and Appendix Table 1-3, in which changes in assets (capital outflows by domestic investors) and changes in liabilities (capital inflows by foreign investors) are shown. From those tables, we find that both 11.1 billion US dollars of increased short-term loans by Korean deposit money banks to abroad (see Appendix Table 1-2) and 12.1 billion US dollars of withdrawn short-term foreign loans to Korean deposit money banks and other institutions (see Appendix Table 1-3) mainly resulted in 6.4 billion US dollars of net capital outflows (see Appendix Table 1-1) on December 1997. The huge short-term capital outflows at that time

were partly covered by the inflows of long-term loans. We understand that the increased short-term loans by deposit money banks to abroad on December 1997 were mainly to help liquidity problems in their foreign branches.⁹ From Appendix Table 1-3, we also find that the withdrawal of short-term foreign loans to deposit money banks and other institutions had started from September 1997 and accelerated from November 1997 until the first half of 1998. Moreover, there were net sells of equity securities by foreign investors during the fourth quarter of 1997, but the volume was small and their portfolio decisions at the Korean stock market were quickly reversed after December 1997. These figures also support our earlier findings.

The sudden withdrawal of foreign loans to domestic financial institutions is also indicated in Appendix Table 2.¹⁰ Until the end of June 1997, there was no significant evidence of loan withdrawal by foreign investors, but it was noticed that foreign investors withdrew huge amount of their loans from domestic financial institutions right before the crisis in October 1997. The total value of loan withdrawal at the end of December 1997 reached a peak of 19.4 billion US dollars during that period. The Japanese and European investors equally share 34% of total withdrawal. The US investors and other nationals share 12.4% and 19.6% of total withdrawal of foreign loans, respectively. Since then, all the foreign investors behaved as a group at the loan market. The herding behavior of foreign investors deepened the shortage of dollar-denominated liquidity at the Korean financial market and contributed to the Korean currency crisis.

With the acceleration of financial liberalization during the 1994-97 period, it was very popular for foreign investors to supply funds through domestic foreign exchange institutions like depository institutions, development institutions, and merchant banks. The increase in

⁹ This situation will be further discussed when we analyze Appendix Table 4 and Appendix Figure 10.

¹⁰ The figures of total changes of outstanding foreign loans to domestic financial institutions in Appendix Table 2 are approximately same as the sum of long- and short-term foreign loans to deposit money banks and other sectors in Appendix Table 1-3.

capital flows through those domestic financial institutions helped maintain a relatively strong won before the crisis occurred. However, the sudden withdrawal of foreign capital from capital and financial accounts in those institutions made the Korean economy highly vulnerable to the speculative currency attack and liquidity crisis since the Thai Baht stopped floating on June 2, 1997.

The liquidity crisis was ignited by the mismanagement of assets and liabilities (short-term foreign credit abused as means of financing long-term domestic investment, see Appendix Table 3 as an example) in those domestic financial institutions and deepened by the foreign financial institutions' decision to stop rolling over their short-term loans. As we can see from Appendix Figure 9, which illustrates the monthly roll-over rates of Korean foreign exchange banks in 1997, those domestic financial institutions encountered serious liquidity problems created by the loss of foreign investors' confidence during the second half of 1997 period. Appendix Table 4 also indicates the domestic banks' huge demand for foreign exchange caused by the termination of foreign bank loans. From 1996 to 1997, there was no distinguished change in their balance sheet except i) 430% increase in inter-office asset transfer (3.3 billion US dollars to 14.1 billion US dollars), ii) 39% fall in foreign borrowings (24.7 billion US dollars to 15.1 billion US dollars), and iii) 21% increase in trust money from the central bank (32.2 billion US dollars to 38.9 billion US dollars). This means that the inter-office transfer cleared the sudden withdrawal of foreign bank loans from domestic banks and the inter-office transfer was financed by borrowings from the Bank of Korea.

In Appendix Figure 10, we illustrate the monthly changing pattern of the above-mentioned three items to find more detailed information about the liquidity position of domestic foreign exchange banks during the crisis period. From the figure, we find that the liquidity shortage caused by foreign investors' withdrawal of bank loans, which started in September 1997 and continued until the end of first quarter in 1998. The fall in foreign

borrowings were met by inter-office transfers that were financed by the central bank since December 1997. Appendix Figure 11 also highlights the sudden shift of foreign short-term capital from those domestic institutions to abroad. This liquidity problem in the Korean capital account would invite speculators to foreign exchange markets and contribute to the Korean currency crisis.

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Table 1. Key Variables of the Korean Stock Market: Daily Values

	Period	Mean	Standard Deviation	Max.	Min.	Skewness
Stock Index (KOSPI)	<i>All</i>	545.35	153.50	793.98	280.00	-0.17
	<i>Before Crisis</i>	699.17	46.52	792.29	565.64	-0.29
	<i>In crisis</i>	417.74	87.82	574.35	280.00	0.12
	<i>After Crisis</i>	500.38	132.23	793.98	291.93	0.15
Exchange Rate (Won/US\$)	<i>All</i>	1,166.02	262.39	1,964.80	828.70	0.35
	<i>Before Crisis</i>	883.60	22.53	922.70	828.70	-0.72
	<i>In crisis</i>	1,394.51	205.69	1,964.80	927.90	-0.19
	<i>After Crisis</i>	1,257.16	72.06	1,403.90	1,149.00	0.52
Rate of Return (%)	<i>All</i>	0.04	2.53	8.50	-8.10	0.21
	<i>Before Crisis</i>	-0.06	1.39	6.08	-4.22	0.42
	<i>In crisis</i>	-0.20	3.22	8.50	-8.10	0.16
	<i>After Crisis</i>	0.54	2.66	7.80	-5.84	0.27
Dollar Rate of Returns (%)	<i>All</i>	-0.03	3.57	25.50	-24.08	0.47
	<i>Before Crisis</i>	-0.10	1.44	6.25	-4.26	0.38
	<i>In crisis</i>	-0.40	5.11	25.50	-24.08	0.51
	<i>After Crisis</i>	0.61	2.93	9.58	-5.91	0.37
Exchange Rate Depreciation Against The US dollar (%)	<i>All</i>	0.07	1.86	16.58	-18.28	-0.65
	<i>Before Crisis</i>	0.04	0.22	0.90	-2.21	-3.86
	<i>In crisis</i>	0.19	2.99	16.58	-18.28	-0.53
	<i>After Crisis</i>	-0.06	0.66	2.52	-2.26	-0.11

**Figure 1. Korea Stock Price Index (KOSPI) and
Exchange Rate of the Korean Won against the US Dollar (FOEX)**

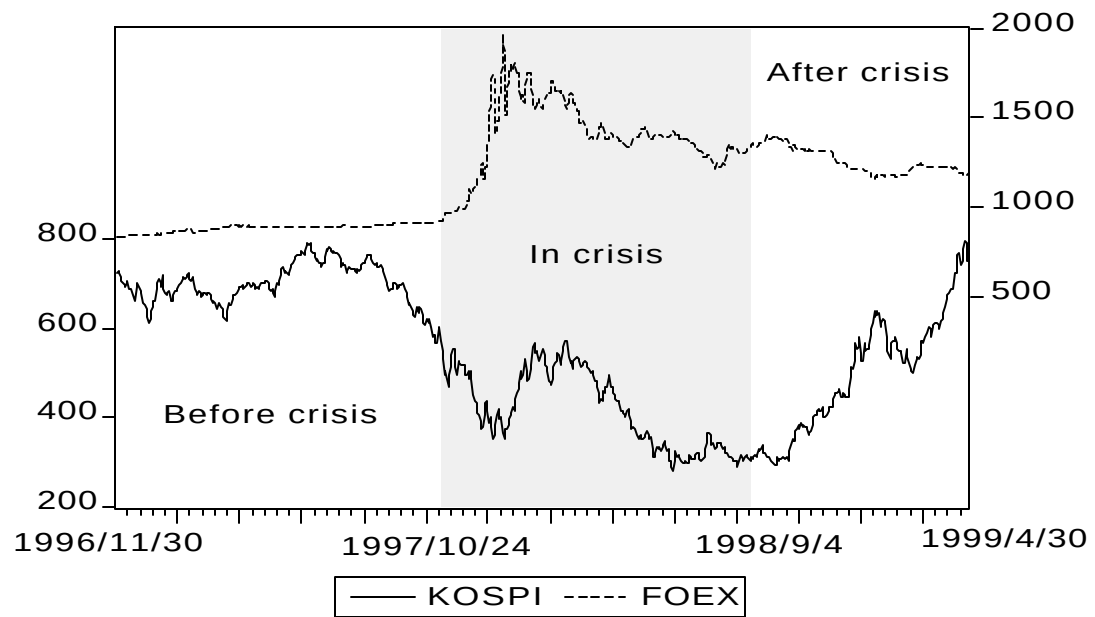


Table 2. Descriptive Statistics for Net Buys by Type of Investors: Daily Values

Unit: 100 Million Won						
	Period	Mean	Standard Deviation	Max.	Min.	Skewness
Net Buys by Foreign Investors	<i>All</i>	131.49	521.22	6114.06	-1348.96	4.06
	<i>Before Crisis</i>	38.64	444.57	6114.06	-881.44	9.86
	<i>In crisis</i>	141.45	548.32	3251.42	-1348.96	2.06
	<i>After Crisis</i>	257.67	561.41	3835.82	-787.24	2.48
Net Buys by Domestic Stock Companies	<i>All</i>	-45.30	244.37	1708.77	-1856.57	-0.62
	<i>Before Crisis</i>	-37.52	145.92	411.47	-1288.46	-3.07
	<i>In crisis</i>	-44.94	142.97	376.20	-543.11	-0.20
	<i>After Crisis</i>	-57.62	420.35	1708.77	-1856.57	-0.21
Net Buys by Domestic Insurance Companies	<i>All</i>	-27.60	132.40	479.10	-1384.97	28.93
	<i>Before Crisis</i>	4.84	51.78	423.49	-154.13	21.51
	<i>In crisis</i>	-18.53	70.29	102.45	-420.26	13.81
	<i>After Crisis</i>	-90.23	230.79	479.10	-1384.97	-1.89
Net Buys by Domestic Investment Trust Companies	<i>All</i>	15.70	345.02	2636.74	-2704.94	1.80
	<i>Before Crisis</i>	-17.09	224.44	786.69	-2704.94	-6.53
	<i>In crisis</i>	-70.04	233.05	737.42	-1611.35	-1.49
	<i>After Crisis</i>	192.09	526.06	2636.74	-773.79	2.16
Net Buys by Domestic Banks	<i>All</i>	-68.83	125.69	328.02	-755.88	-2.36
	<i>Before Crisis</i>	-23.71	56.25	264.99	-402.55	-1.42
	<i>In crisis</i>	-77.87	136.52	106.45	-753.84	-2.37
	<i>After Crisis</i>	-123.96	157.19	328.02	-755.88	-1.36
Net Buys by Domestic Merchant Banks and Savings & Finance Companies	<i>All</i>	-4.00	66.25	571.07	-321.43	0.65
	<i>Before Crisis</i>	9.47	27.51	147.35	-95.54	0.77
	<i>In crisis</i>	-9.71	71.39	571.07	-270.80	2.23
	<i>After Crisis</i>	-16.01	91.92	402.75	-321.43	-0.11
Net Buys by Domestic Mutual Aid Funds	<i>All</i>	-5.24	200.96	304.06	-5163.81	-24.66
	<i>Before Crisis</i>	-2.59	12.47	76.06	-50.07	1.39
	<i>In crisis</i>	0.58	26.11	145.31	-129.44	0.47
	<i>After Crisis</i>	-17.84	400.68	304.05	-5136.81	-12.41
Net Buys by Domestic Government Funded Institutions	<i>All</i>	-9.98	158.27	830.09	-1111.82	-2.43
	<i>Before Crisis</i>	4.03	61.26	290.63	-329.53	-1.06
	<i>In crisis</i>	4.99	94.39	502.92	-616.67	-1.76
	<i>After Crisis</i>	-52.86	281.16	830.09	-1111.82	-1.20
Net Buys by Domestic Individual	<i>All</i>	13.74	557.91	3620.31	-2339.26	0.26
	<i>Before Crisis</i>	23.88	254.06	1122.74	-1350.31	-0.59
	<i>In crisis</i>	74.40	481.30	1601.50	-1870.38	-0.52
	<i>After Crisis</i>	-91.24	889.46	3620.31	-2339.26	0.66

Figure 2A. Net Buys by Type of Investors

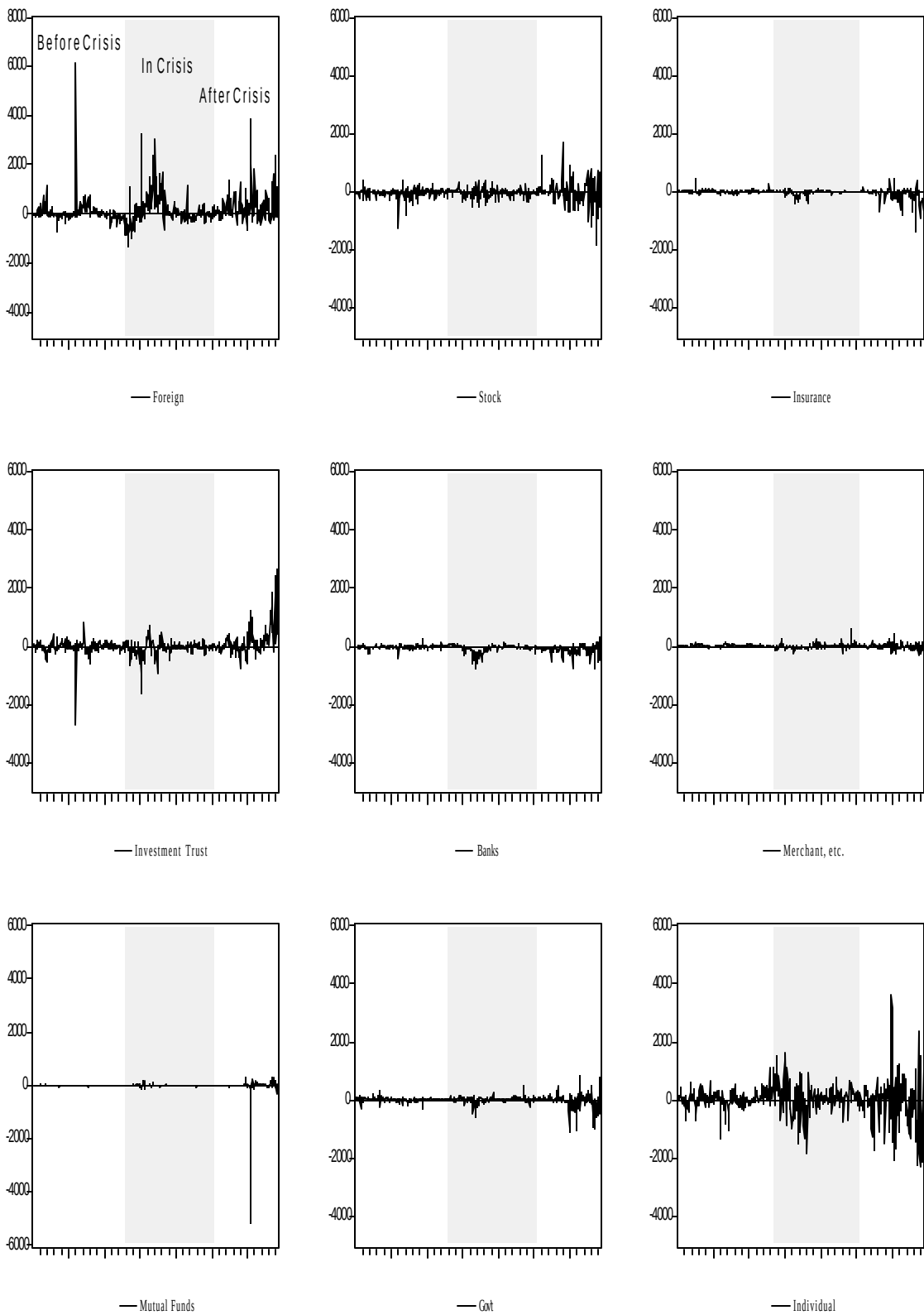


Figure 2B. Net Buys by Type of Investors During the Early Stage of the Crisis

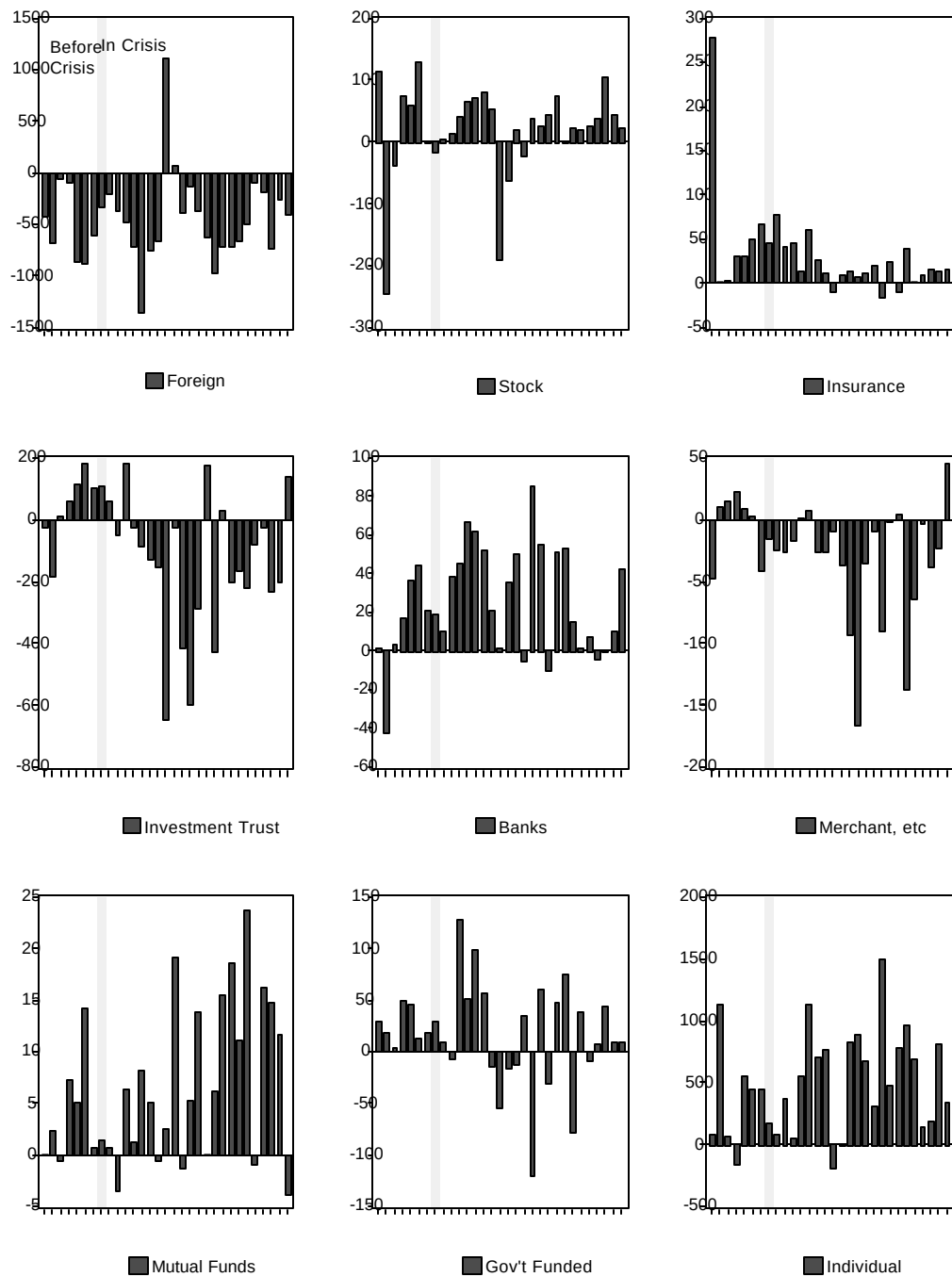


Figure 3. Total Transaction Share (%) by Type of Investors

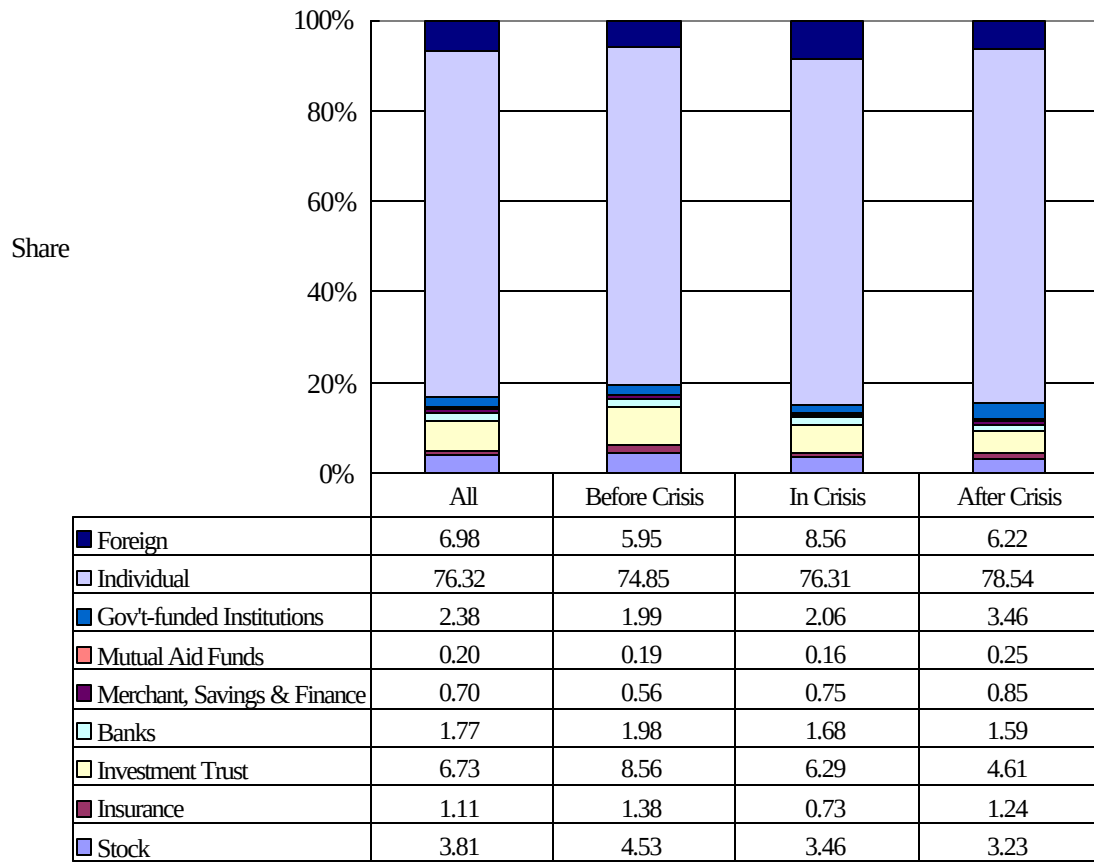


Table 3. Foreign Ownership Limit

Date	Limit	Date	Limit
January 1992	10%	May 1997	23%
December 1994	12%	November 1997	26%
July 1995	15%	December 12, 1997	50%
April 1996	18%	December 30, 1997	55%
October 1996	20%	May 1998	100%

Source: Bank of Korea, Financial Market in Korea, July 1999.

Table 4. Buy and Sell Share (%) by Type of Investors

		Domestic Investors									
		All	Stock	Insurance	Investment Trust	Banks	Merchant Banks and Savings & Finance	Mutual Aid Funds	Gov't Funded Inst.	Individual	
Buys											
	All	7.4	92.6	3.5	1.1	6.5	1.3	0.7	0.2	2.5	76.7
	Before Crisis	6.0	94.0	4.2	1.5	8.5	1.8	0.6	0.2	2.1	75.2
	In Crisis	9.1	90.9	3.0	0.7	5.7	1.1	0.7	0.2	2.2	77.3
	After Crisis	7.0	93.0	3.1	1.0	4.9	1.1	0.8	0.2	3.5	78.3
Sells											
	All	6.6	93.4	4.1	1.2	6.9	2.2	0.7	0.2	2.3	75.9
	Before Crisis	5.9	94.1	4.8	1.3	8.6	2.2	0.5	0.2	1.9	74.5
	In Crisis	8.0	92.0	3.9	0.8	6.9	2.3	0.8	0.2	1.9	75.4
	After Crisis	5.4	94.6	3.3	1.5	4.3	2.1	0.9	0.3	3.4	78.8

Table 5. Feedback Trading by Foreign Investors During the Whole Period

	<u>All Investors</u>		<u>Individual Investors</u>		<u>Institutional Investors</u>	
	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value
ALL						
S-Ratio	0.032	6.04	0.065	4.11	0.028	5.32
D-Ratio	0.054	11.30	0.033	1.47	0.054	11.34
N-Ratio	0.011	6.04	0.029	3.18	0.009	5.05
USA						
S-Ratio	0.032	3.05	-0.111	-2.78	0.032	3.03
D-Ratio	0.048	5.23	0.014	0.43	0.052	5.47
N-Ratio	0.012	0.51	0.022	1.63	0.011	3.06
UK						
S-Ratio	0.012	1.03	-0.087	-0.74	0.015	1.29
D-Ratio	0.059	5.31	-0.067	-0.60	0.062	5.52
N-Ratio	0.001	0.14	-0.069	-1.53	0.002	0.48
JAPAN						
S-Ratio	0.100	3.82	0.057	1.25	0.020	0.79
D-Ratio	0.111	5.06	0.175	3.50	0.077	3.49
N-Ratio	0.034	3.49	0.110	4.63	-0.003	-0.37
GERMANY						
S-Ratio	-0.073	-0.95	-0.453	-1.56	0.004	0.07
D-Ratio	0.086	1.35	-0.048	-0.29	0.074	1.34
N-Ratio	0.014	0.72	-0.062	-0.92	-0.522	-35.89
REST OF AMERICA						
S-Ratio	0.044	1.75	-0.014	-0.09	0.041	1.67
D-Ratio	0.043	2.02	-0.217	-1.79	0.058	2.70
N-Ratio	0.021	2.37	0.021	0.33	0.018	2.21
REST OF EUROPE						
S-Ratio	0.032	3.00	0.544	1.66	0.032	2.93
D-Ratio	0.039	4.25	-0.230	-0.57	0.040	4.39
N-Ratio	0.011	3.08	0.186	1.47	0.011	3.02
REST OF ASIA						
S-Ratio	0.036	2.62	0.102	2.11	0.020	1.49
D-Ratio	0.065	5.15	0.072	1.54	0.061	4.81
N-Ratio	0.013	2.73	0.028	1.66	0.009	1.95
OTHERS						
S-Ratio	0.038	1.78	-0.316	-2.51	0.053	2.47
D-Ratio	0.057	3.07	-0.091	-0.95	0.063	3.34
N-Ratio	0.008	1.14	-0.040	-1.01	0.010	1.41

Table 6. Feedback Trading by Foreign Investors Before the Crisis

	<u>All Investors</u>		<u>Individual Investors</u>		<u>Institutional Investors</u>	
	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value
ALL						
S-Ratio	-0.020	-1.75	0.090	1.74	-0.028	-2.37
D-Ratio	-0.018	-1.80	0.056	1.28	-0.023	-2.26
N-Ratio	-0.007	-1.79	0.048	2.91	-0.011	-2.69
USA						
S-Ratio	-0.021	-0.90	0.093	1.25	-0.036	-1.48
D-Ratio	-0.017	-0.83	0.039	0.67	-0.023	-1.10
N-Ratio	-0.002	-0.29	0.047	1.92	-0.009	-1.06
UK						
S-Ratio	-0.021	-0.79	-0.297	n.a.	-0.026	-0.95
D-Ratio	0.007	0.26	-0.299	n.a.	0.002	0.10
N-Ratio	-0.017	-1.96	-0.121	n.a.	-0.020	-2.23
JAPAN						
S-Ratio	-0.048	-0.82	-0.056	-0.42	-0.044	-0.79
D-Ratio	-0.032	-0.75	-0.108	-1.15	-0.003	-0.07
N-Ratio	-0.016	-0.90	0.020	0.47	-0.030	-1.75
GERMANY						
S-Ratio	-0.079	-0.85	-0.165	-1.08	0.007	0.28
D-Ratio	-0.063	-0.38	-0.083	-0.27	-0.044	-0.28
N-Ratio	0.043	1.03	0.081	2.07	0.004	0.28
REST OF AMERICA						
S-Ratio	0.030	0.66	-0.109	-0.45	0.033	0.70
D-Ratio	-0.013	-0.34	-0.255	-1.17	0.000	0.00
N-Ratio	-0.019	-1.13	-0.027	-0.25	-0.019	-1.15
REST OF EUROPE						
S-Ratio	-0.020	-0.91	0.000	n.a.	-0.021	-0.91
D-Ratio	-0.028	-1.49	0.000	n.a.	-0.028	-1.49
N-Ratio	-0.005	-0.63	0.000	n.a.	-0.005	-0.63
REST OF ASIA						
S-Ratio	-0.019	-0.72	0.141	1.34	-0.035	-1.27
D-Ratio	-0.026	-1.13	0.153	1.61	-0.045	-1.85
N-Ratio	-0.002	-0.22	0.049	1.43	-0.008	-0.85
OTHERS						
S-Ratio	-0.019	-0.43	0.071	0.28	-0.025	-0.56
D-Ratio	0.023	0.53	0.052	0.28	0.019	0.44
N-Ratio	-0.019	-1.29	0.002	0.28	-0.019	-1.31

Note: n.a. because of small sample problem

Table 7. Feedback Trading by Foreign Investors During the Crisis

	<u>All Investors</u>		<u>Individual Investors</u>		<u>Institutional Investors</u>	
	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value
ALL						
S-Ratio	0.745	76.01	0.500	7.02	0.138	6.24
D-Ratio	0.268	18.45	0.300	6.20	0.252	16.30
N-Ratio	0.054	6.55	0.184	6.21	0.031	3.84
USA						
S-Ratio	0.192	4.59	0.521	4.48	0.140	3.22
D-Ratio	0.256	9.28	0.229	3.82	0.254	8.38
N-Ratio	0.074	4.61	0.235	4.62	0.049	3.07
UK						
S-Ratio	0.113	2.64	-0.357	-2.21	0.119	2.75
D-Ratio	0.228	7.41	0.104	0.47	0.130	4.17
N-Ratio	0.016	0.99	-0.266	-3.71	0.019	1.20
JAPAN						
S-Ratio	0.370	4.07	0.627	4.60	0.073	0.69
D-Ratio	0.344	6.23	0.360	3.57	0.277	4.24
N-Ratio	0.124	3.44	0.244	4.62	0.020	0.54
GERMANY						
S-Ratio	1.067	n.a.	1.059	n.a.	n.a.	n.a.
D-Ratio	0.370	n.a.	-0.516	n.a.	n.a.	n.a.
N-Ratio	0.431	n.a.	0.324	n.a.	n.a.	n.a.
REST OF AMERICA						
S-Ratio	0.295	2.76	n.a.	n.a.	0.296	2.77
D-Ratio	0.302	4.80	n.a.	n.a.	0.302	4.79
N-Ratio	0.075	1.56	n.a.	n.a.	0.077	1.60
REST OF EUROPE						
S-Ratio	0.150	3.40	1.132	n.a.	0.144	3.27
D-Ratio	0.252	8.35	0.536	n.a.	0.250	8.25
N-Ratio	0.034	2.07	0.447	n.a.	0.031	1.92
REST OF ASIA						
S-Ratio	0.294	4.53	0.428	2.53	0.071	0.96
D-Ratio	0.330	7.40	0.343	2.67	0.227	4.03
N-Ratio	0.081	3.28	0.120	1.90	0.004	0.14
OTHERS						
S-Ratio	0.206	2.01	n.a.	n.a.	0.211	2.06
D-Ratio	0.275	3.95	n.a.	n.a.	0.282	4.07
N-Ratio	0.024	0.60	n.a.	n.a.	0.023	0.57

Note: n.a. because of small sample problem

Table 8. Feedback Trading by Foreign Investors After the Crisis

	<u>All Investors</u>		<u>Individual Investors</u>		<u>Institutional Investors</u>	
	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value	Highest 20% - Lowest 20%	t-value
ALL						
S-Ratio	0.616	77.69	-0.138	-1.28	-0.178	-6.99
D-Ratio	0.064	2.95	-0.251	-3.59	0.088	3.90
N-Ratio	-0.012	-1.45	0.018	0.38	-0.013	-1.62
USA						
S-Ratio	-0.189	-3.89	-0.209	-1.10	-0.180	-3.59
D-Ratio	0.085	1.99	-0.131	-0.91	0.106	2.35
N-Ratio	-0.025	-1.46	-0.017	-0.23	-0.021	-1.28
UK						
S-Ratio	-0.173	-3.33	-0.855	-5.46	-0.155	-2.94
D-Ratio	0.035	0.79	-0.727	-6.77	0.044	0.96
N-Ratio	-0.025	-1.55	-0.485	-5.59	-0.018	-1.09
JAPAN						
S-Ratio	-0.163	-1.34	-0.171	-0.79	-0.071	-0.50
D-Ratio	0.005	0.05	-0.354	-4.27	0.344	2.68
N-Ratio	0.057	1.25	0.107	1.12	0.010	0.24
GERMANY						
S-Ratio	-0.618	-1.78	n.a.	n.a.	-0.298	n.a.
D-Ratio	-0.025	-0.09	n.a.	n.a.	0.145	n.a.
N-Ratio	-0.067	-0.42	n.a.	n.a.	0.005	n.a.
REST OF AMERICA						
S-Ratio	-0.020	-0.20	0.775	2.83	-0.048	-0.50
D-Ratio	0.086	0.89	-0.512	-1.73	0.127	1.26
N-Ratio	0.016	0.40	0.475	3.06	-0.006	-0.19
REST OF EUROPE						
S-Ratio	-0.195	-3.79	0.831	n.a.	-0.196	-3.80
D-Ratio	0.082	1.77	-0.884	n.a.	0.093	2.00
N-Ratio	-0.003	-0.19	0.466	n.a.	-0.002	-0.15
REST OF ASIA						
S-Ratio	-0.150	-2.38	0.081	0.43	-0.194	-2.95
D-Ratio	0.048	0.91	-0.100	-0.79	0.089	1.54
N-Ratio	-0.007	-0.35	0.060	0.75	-0.023	-1.16
OTHERS						
S-Ratio	-0.210	-1.75	n.a.	n.a.	-0.205	-1.65
D-Ratio	0.140	1.33	n.a.	n.a.	0.147	1.29
N-Ratio	0.023	0.56	n.a.	n.a.	0.030	0.78

Note: n.a. because of small sample problem

Table 9. Granger Causality Tests (With 5-day lags)

	All Period			Before crisis			In crisis			After crisis		
	F-Stat.	P-Value	Reject?	F-Stat.	P-Value	Reject?	F-Stat.	P-Value	Reject?	F-Stat.	P-Value	Reject?
NBF does not Granger Cause RFKOSPI	2.84	0.02	Y	0.18	0.97		1.83	0.11		1.13	0.35	
RFKOSPI does not Granger Cause NBF	5.89	0.00	Y	2.67	0.02	Y	3.46	0.00	Y	4.44	0.00	Y
NBD does not Granger Cause RKOSPI	2.38	0.04	Y	0.26	0.93		2.36	0.04	Y	0.66	0.65	
RKOSPI does not Granger Cause NBD	11.93	0.00	Y	2.50	0.03	Y	7.72	0.00	Y	4.91	0.00	Y
NBD1 does not Granger Cause RKOSPI	1.39	0.23		0.31	0.91		1.24	0.29		1.32	0.26	
RKOSPI does not Granger Cause NBD1	1.30	0.26		0.55	0.74		1.12	0.35		0.44	0.82	
NBD2 does not Granger Cause RKOSPI	1.17	0.32		2.75	0.02	Y	3.32	0.01	Y	0.58	0.71	
RKOSPI does not Granger Cause NBD2	2.86	0.01	Y	2.57	0.03	Y	2.73	0.02	Y	1.55	0.18	
NBD3 does not Granger Cause RKOSPI	4.78	0.00	Y	0.82	0.54		4.90	0.00	Y	0.97	0.44	
RKOSPI does not Granger Cause NBD3	0.79	0.56		1.18	0.32		1.44	0.21		1.34	0.25	
NBD4 does not Granger Cause RKOSPI	0.90	0.48		1.15	0.33		1.88	0.10		0.41	0.84	
RKOSPI does not Granger Cause NBD4	3.77	0.00	Y	1.83	0.11		2.64	0.02	Y	2.12	0.07	Y/N
NBD5 does not Granger Cause RKOSPI	1.43	0.21		1.78	0.12		0.96	0.45		1.09	0.37	
RKOSPI does not Granger Cause NBD5	4.38	0.00	Y	0.16	0.98		3.79	0.00	Y	1.47	0.20	
NBD6 does not Granger Cause RKOSPI	0.93	0.46		0.39	0.86		3.23	0.01	Y	0.58	0.72	
RKOSPI does not Granger Cause NBD6	2.97	0.01	Y	1.60	0.16		1.11	0.36		2.16	0.06	Y/N
NBD7 does not Granger Cause RKOSPI	0.38	0.86		0.70	0.62		0.51	0.77		0.50	0.78	
RKOSPI does not Granger Cause NBD7	1.78	0.12		0.78	0.57		1.94	0.09	Y/N	0.64	0.67	
NBD8 does not Granger Cause RKOSPI	6.32	0.00	Y	3.08	0.01	Y	3.57	0.00	Y	1.34	0.25	
RKOSPI does not Granger Cause NBD8	8.43	0.00	Y	3.75	0.00	Y	3.74	0.00	Y	2.38	0.04	Y

Notes: NBF-Net Buys by Foreign Investors
NBD-Net Buys by Domestic Investors
NBD1-Net Buys by Stock Companies
NBD3-Net Buys by Investment Trust Companies
NBD5-Net Buys by Merchant Banks and Savings & Finance Companies
NBD7-Net Buys by Government Funded Institutions
Ys indicate significant at the 5% level

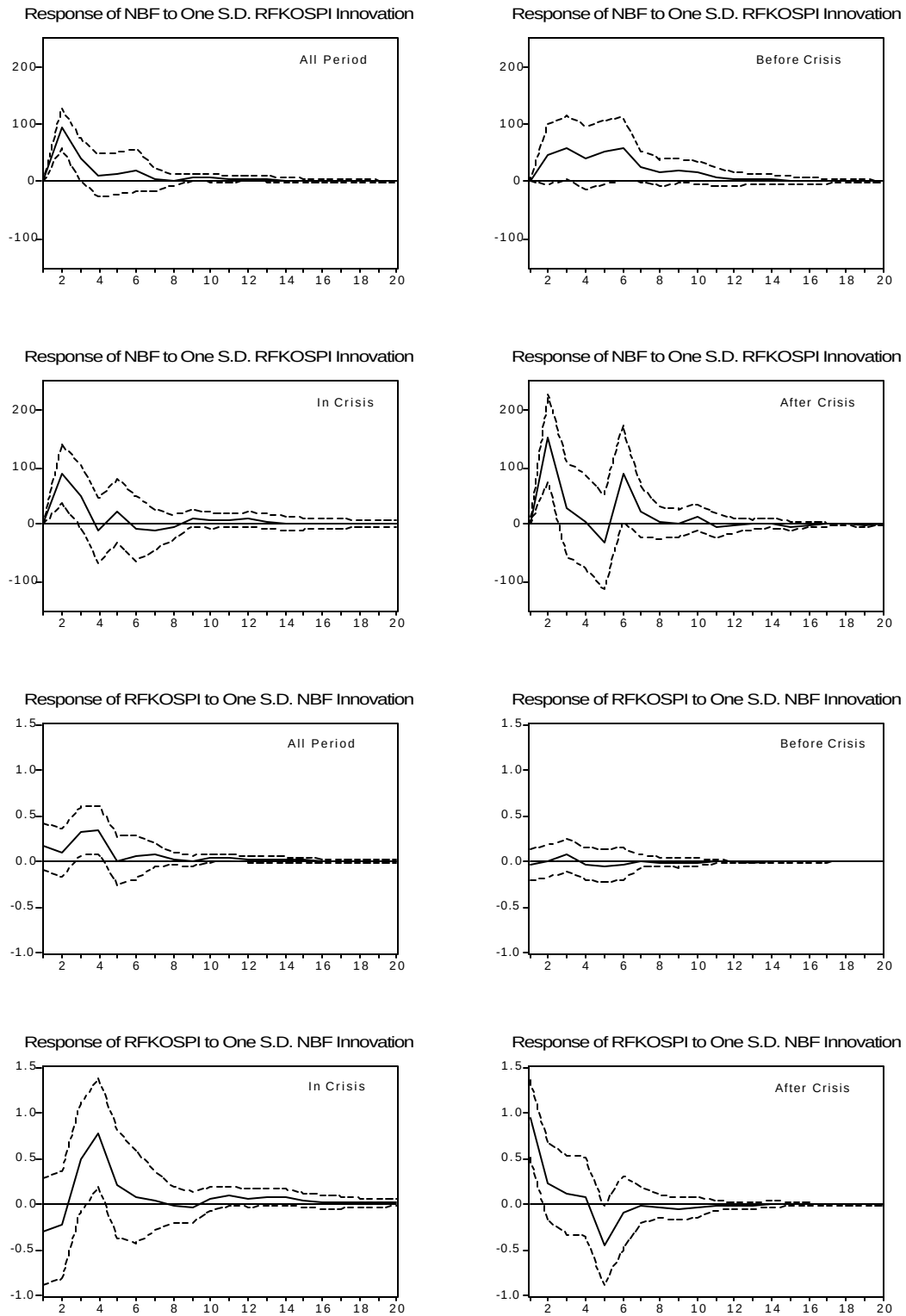
RFKOSPI-Dollar Rate of Return on Stock
RKOSPI-Rate of Return on Stock
NBD2-Net Buys by Insurance Companies
NBD4-Net Buys by Banks
NBD6-Net Buys by Mutual Aid Funds
NBD8-Net Buys by Individual
Y/Ns indicate significant at the 10% level

Table 10. Unit Root Test

	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	Lag	Statistics	Lag	Statistics
Net Buys by Foreign Investors	0	-17.50**	4	-18.66**
	4	-7.36**	6	-18.66**
Net Buys by Domestic Investors	0	-17.50**	4	-18.03**
	4	-7.36**	6	-18.66**
I. Stock Companies	0	-19.34**	4	-19.41**
	4	-9.69**	6	-19.45**
II. Insurance Companies	0	-15.60**	4	-16.15**
	4	-7.22**	6	-16.66**
III. Investment Trust Companies	0	-13.25**	4	-13.21**
	4	-5.47**	6	-13.78**
IV. Banks	0	-14.33**	4	-14.51**
	4	-5.97**	6	-15.18**
V. Merchant Banks and Savings & Finance Companies	0	-20.41**	4	-20.69**
	4	-9.72**	6	-20.90**
VI. Mutual Aid Funds	0	-25.16**	4	-25.18**
	4	-11.61**	6	-25.17**
VII. Government Funded Institutions	0	-18.45**	4	-19.12**
	4	-7.70**	6	-19.75**
VIII. Individual	0	-15.85**	4	-15.65**
	4	-10.33**	6	-15.41**
Rate of Return on Stocks	0	-21.88**	4	-21.77**
	4	-12.70**	6	-21.65**
Dollar Rate of Return on Stocks	0	-20.92**	4	-20.65**
	4	-14.08**	6	-20.45**

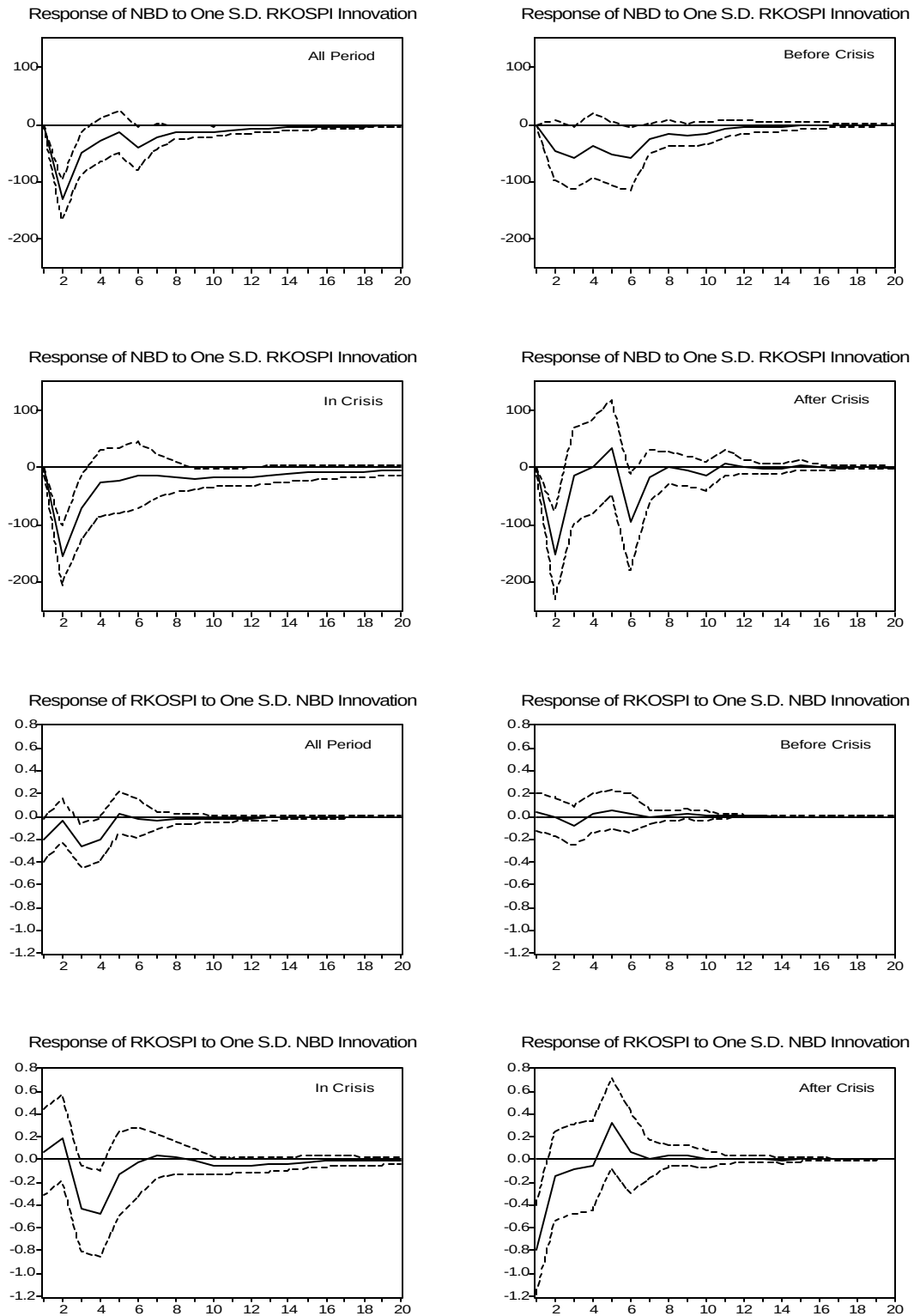
** numbers indicate significant at the 1% level.

**Figure 4. Impulse Responses of Net Buys by Foreign Investors
(NBF, 100 Million Won) And Dollar Rate of Return (RFKOSPI, %)**



Note: Dotted lines indicate the significance range at the 95% level.

Figure 5. Impulse Responses of Net Buys by Domestic Investors (NBD, 100 Million Won) And Rate of Return (RKOSPI, %)



Note: Dotted lines indicate the significance range at the 95% level.

**Table 11. Evaluations on the Relationship
between Net Buys and Rate of Return by Type of Investors**

Type of Investors (Transaction Share, %)	Methods	Granger Causality		Immediate (1 ~ 2 days) Impulse Response	
		Return Buys	Buys Return	Return Buys	Buys Return
All Period					
Foreign (7.0)		***	**	Positive**	Positive
Domestic (93.0)		***	**	Negative**	Negative
Stock (3.8)				Negative	Positive**
Insurance (1.1)		***		Negative	Negative
Investment Trust (6.7)			***	Positive	Positive**
Banks (1.8)		***		Negative**	Negative**
Merchant and Savings & Finance (0.7)		***		Negative**	Positive
Mutual Aids Fund (0.2)		***		Negative	Negative
Government Funded Institutions (2.4)				Negative	Negative**
Individual (76.3)		***	***	Negative**	Negative**
Before Crisis					
Foreign (6.0)		**		Positive	Positive
Domestic (94.0)		**		Negative	Negative
Stock (4.5)				Negative	Positive
Insurance (1.4)		**	**	Negative**	Positive
Investment Trust (8.6)				Positive	Negative
Banks (2.0)				Negative	Negative
Merchant and Savings & Finance (0.6)				Positive	Negative
Mutual Aids Fund (0.2)				Negative	Negative
Government Funded Institutions (2.0)				Negative	Negative
Individual (74.9)		***	***	Negative**	Positive**
In Crisis					
Foreign (8.6)		***		Positive**	Negative
Domestic (91.4)		***	**	Negative**	Positive
Stock (3.5)				Negative	Positive
Insurance (0.7)		**	***	Negative**	Negative
Investment Trust (6.3)			***	Negative	Positive**
Banks (1.7)		**		Negative**	Negative**
Merchant and Savings & Finance (0.8)		***		Negative**	Negative
Mutual Aids Fund (0.2)			***	Negative	Positive
Government Funded Institutions (2.1)		*		Negative**	Negative**
Individual (76.3)		***	***	Negative**	Positive
After Crisis					
Foreign (6.2)		***		Positive**	Positive**
Domestic (93.8)		***		Negative**	Negative**
Stock (3.2)				Negative	Positive**
Insurance (1.2)				Negative	Positive
Investment Trust (4.6)				Positive	Positive
Banks (1.6)		*		Positive	Negative
Merchant and Savings & Finance (0.9)				Positive	Positive
Mutual Aids Fund (0.3)		*		Negative	Negative
Government Funded Institutions (3.5)				Positive	Negative**
Individual (78.5)		**		Negative**	Negative**

*, **, and *** indicate significant at the 10%, 5%, and 1% level, respectively.

Figure 6. Volatility of the Rate of Return (RKOSPI, %) on the Korean Stock

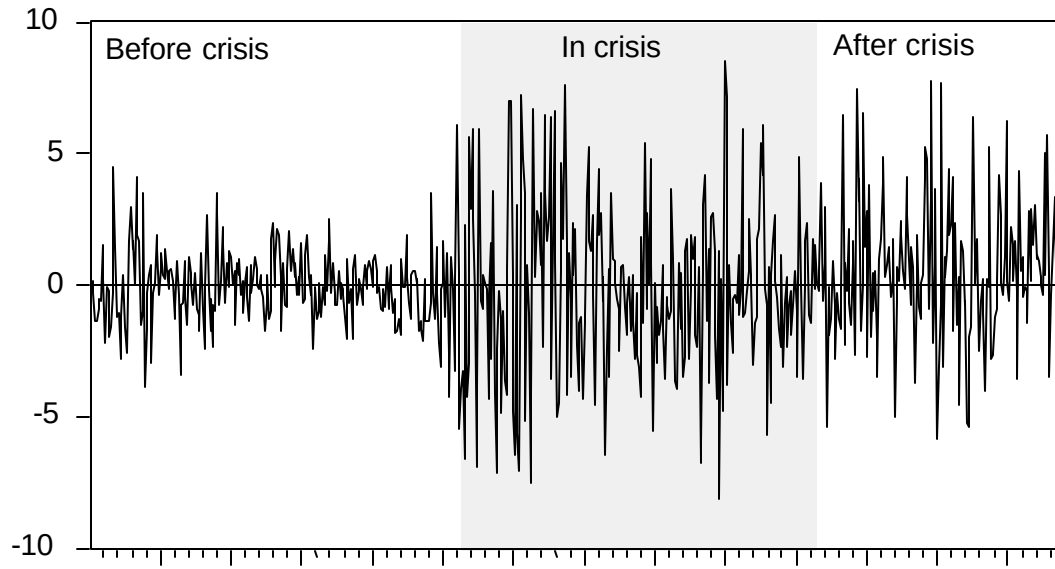


Table 12. Volatility Test by GARCH(1,1)

	Mean Equation			Variance Equation						Log Likelihood
	In Crisis Dummy	After Crisis Dummy	Net Buys by Foreign Investors (NBF)	Constant Term	ARCH Term	GARCH Term	In Crisis Dummy	After Crisis Dummy	Square of Net Buys by Foreign Investors	
1				0.0225 (0.2112)	0.0912 (0.0000)	0.9120 (0.0000)				-1494.0
2	0.0997 (0.5136)			0.1082 (0.0786)	0.1022 (0.0014)	0.8390 (0.0000)	0.4768 (0.0731)			-1487.9
3		0.6193 (0.0022)		0.0428 (0.0927)	0.1075 (0.0000)	0.8851 (0.0000)		0.1994 (0.0640)		-1487.5
4	-0.2753 (0.1395)	0.8684 (0.0011)		0.1078 (0.0610)	0.1122 (0.0007)	0.8312 (0.0000)	0.4250 (0.1065)	0.0582 (0.7459)		-1482.9
5			0.0003 (0.0008)	0.0223 (0.2518)	0.0951 (0.0000)	0.9076 (0.0000)			0.0000 (0.8418)	-1491.3
6	0.0799 (0.8754)		0.0005 (0.0906)	3.9655 (0.1934)	0.1500 (0.2233)	0.6000 (0.0472)	0.0000 (1.0000)		0.0000 (0.4563)	-1630.3
7		0.6035 (0.0024)	0.0003 (0.0077)	0.0504 (0.0893)	0.1222 (0.0000)	0.8683 (0.0000)		0.2297 (0.0514)	0.0000 (0.8179)	-1485.2
8	-0.2140 (0.6851)	0.7608 (0.0870)	0.0005 (0.1196)	3.9120 (0.2086)	0.1500 (0.2299)	0.6000 (0.0551)	0.0000 (1.0000)	0.0000 (1.0000)	0.0000 (0.4192)	-1625.0

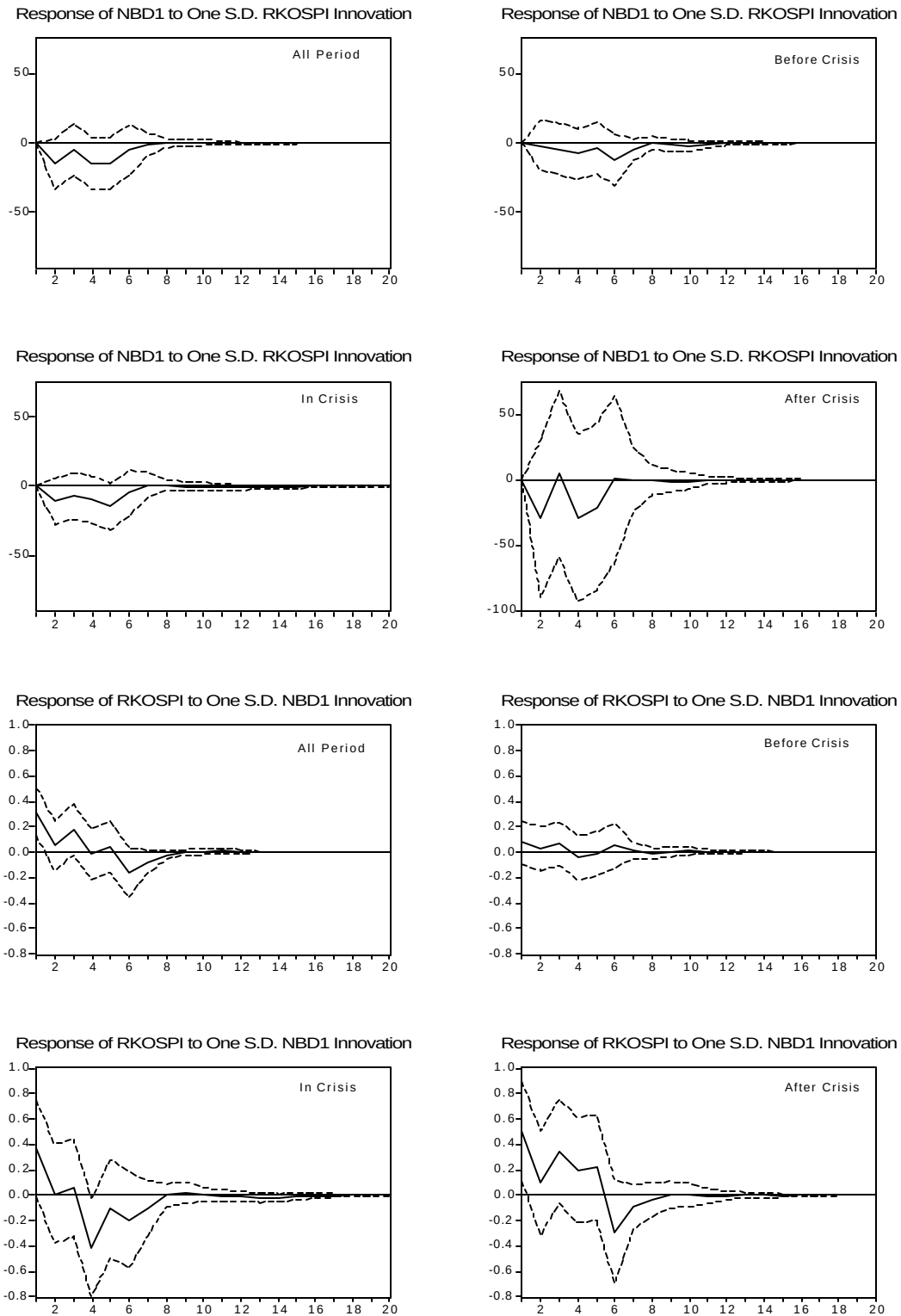
Notes: Figures in parenthesis are p-values.
 Bold numbers indicate significant at the 5% level.
 Bold and italic numbers indicate significant at the 10% level.
 NBF has the unit of 100 Million Won.

Table 13. Volatility Test by GARCH (1,1) without Dummy Variables

	Mean Equation	Variance Equation				Log Likelihood
	Net Buys By Domestic Investors (NBD)	Constant	ARCH	GARCH	Square of Net Buys by Domestic Investors	
GARCH (1,1)						
Foreign Investors	0.0003 (0.0008)	0.0223 (0.2518)	0.0951 (0.0000)	0.9076 (0.0000)	0.00000001 (0.8418)	-1491.3
Domestic Investors (All)	-0.0006 (0.0000)	0.0600 (0.0634)	0.1466 (0.0000)	0.8482 (0.0000)	0.00000002 (0.5306)	-1497.9
1. Stock Companies	0.0012 (0.0001)	0.0237 (0.2355)	0.1040 (0.0000)	0.8954 (0.0000)	0.00000046 (0.1263)	-1487.1
2. Insurance Companies	-0.0010 (0.0965)	0.0252 (0.1926)	0.0955 (0.0000)	0.9056 (0.0000)	0.00000074 (0.5192)	-1492.5
3. Investment Trust Companies	0.0010 (0.0004)	3.9360 (0.1513)	0.1500 (0.2007)	0.6000 (0.0230)	-0.00000081 (0.0854)	-1627.5
4. Banks	-0.0035 (0.0000)	0.0267 (0.1507)	0.0972 (0.0000)	0.9054 (0.0000)	0.00000012 (0.9213)	-1482.6
5. Merchant Banks and Savings & Finance Companies	0.0009 (0.5407)	0.0257 (0.1956)	0.0957 (0.0000)	0.9038 (0.0000)	0.00000492 (0.4031)	-1493.6
6. Mutual Aid Funds	-0.0008 (0.0014)	3.9964 (0.1904)	0.1500 (0.2436)	0.6000 (0.0383)	-0.00000045 (0.4969)	-1633.4
7. Government Funded Institutions	-0.0029 (0.0000)	0.0236 (0.2319)	0.0967 (0.0000)	0.9056 (0.0000)	0.00000027 (0.6832)	-1481.8
8. Individual	-0.0007 (0.0001)	0.0343 (0.1411)	0.1070 (0.0000)	0.8904 (0.0000)	0.00000010 (0.4087)	-1486.3

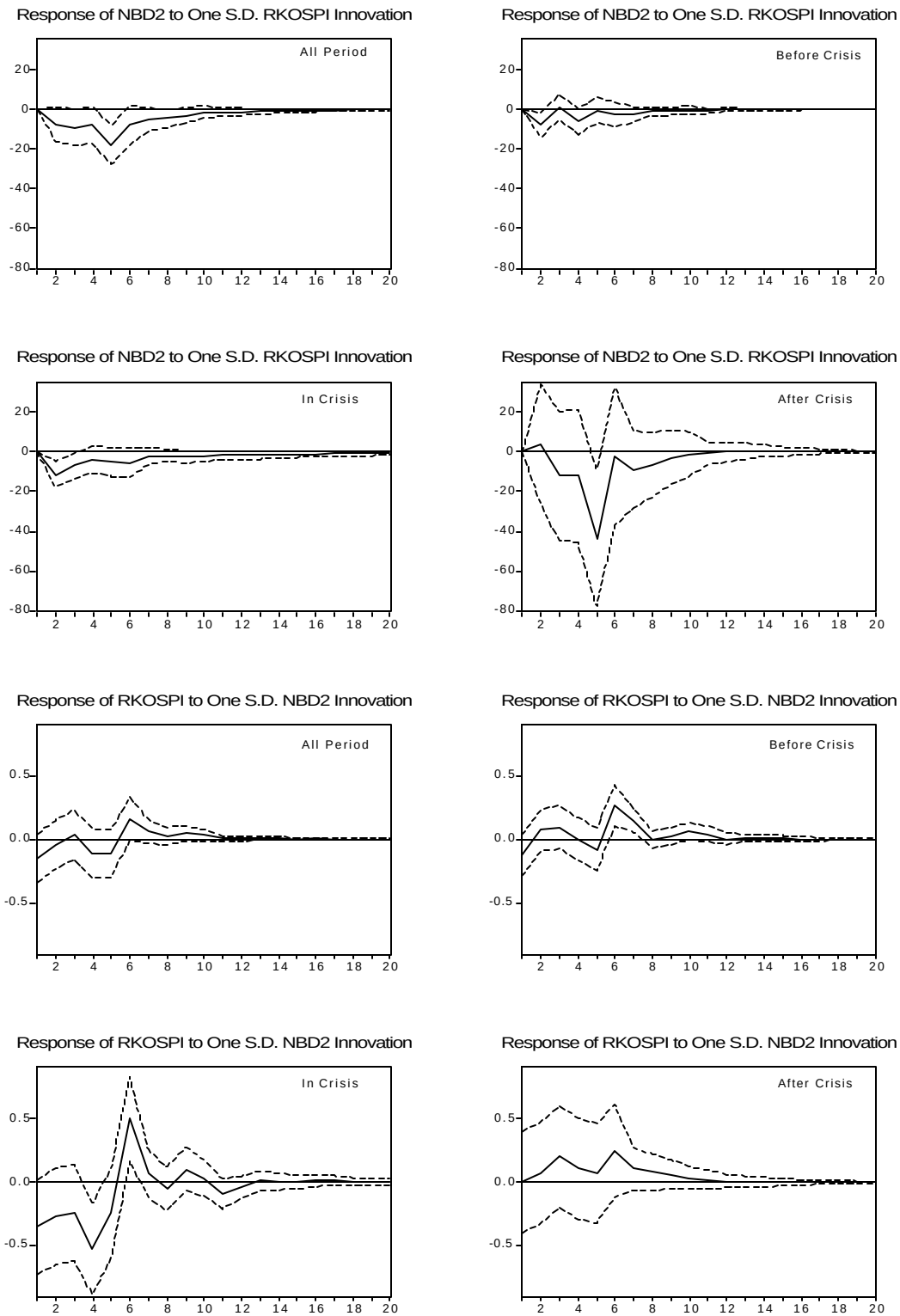
Notes: Figures in parenthesis are p-values.
NBD has the unit of 100 Million Won.

**Appendix Figure 1. Impulse Responses of Net Buys by Stock Companies
(NBD1, 100 Million Won) And Rate of Return (RKOSPI, %)**



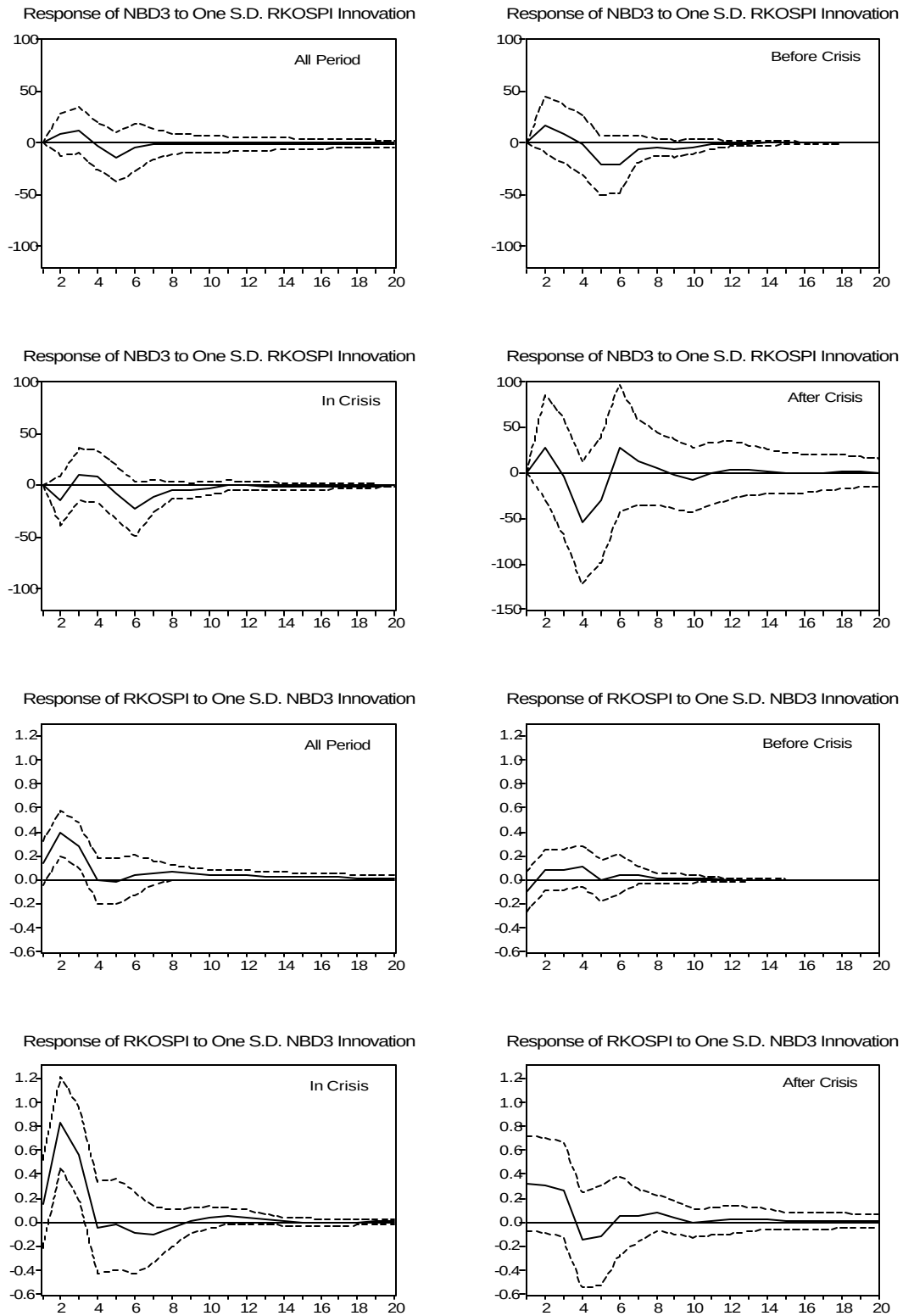
Note: Dotted lines indicate the significance range at the 95% level.

**Appendix Figure 2. Impulse Responses of Net Buys by Insurance Companies
(NBD2, 100 Million Won) And Rate of Return (RKOSPI, %)**



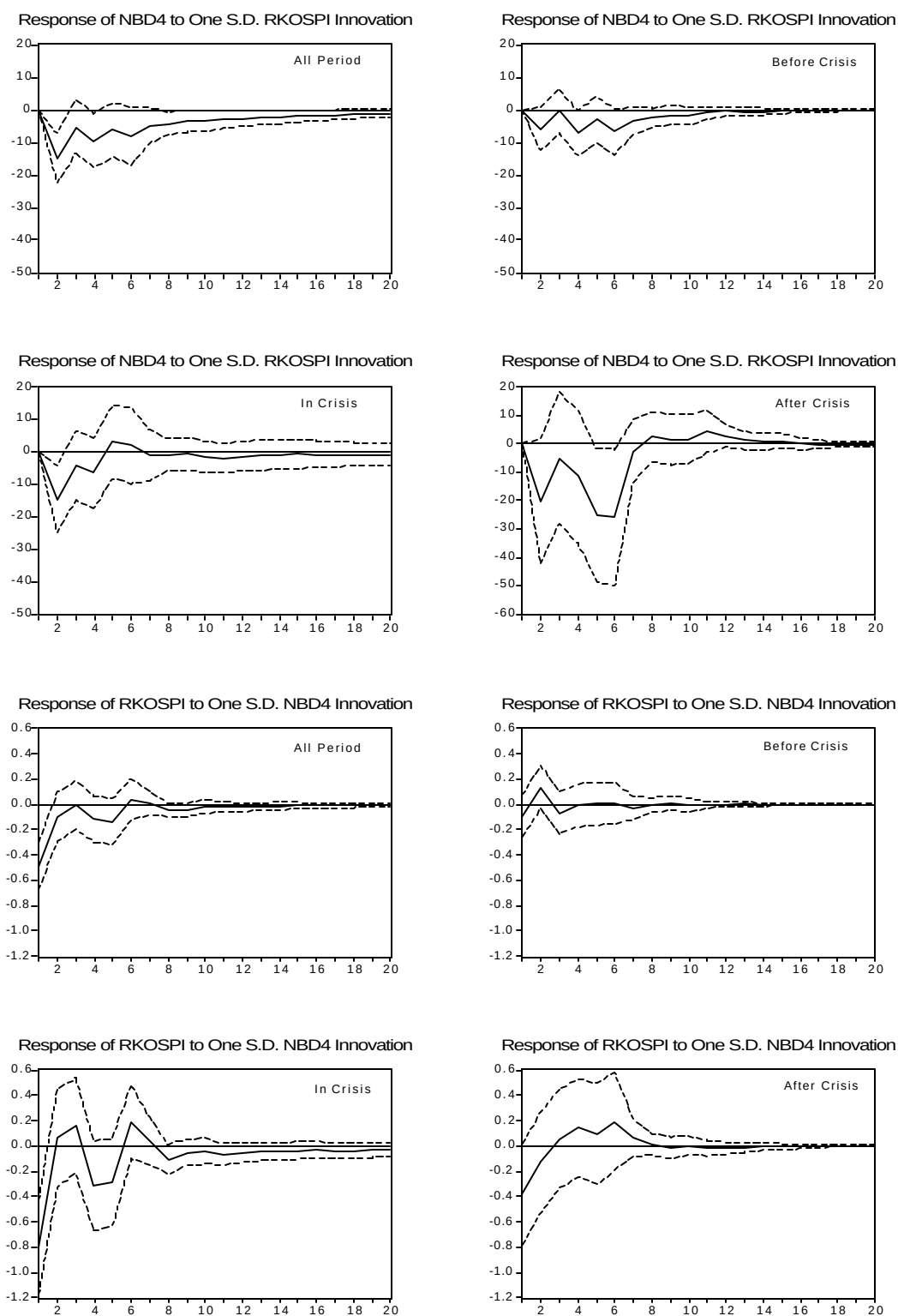
Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 3. Impulse Responses of Net Buys by Investment Trust Companies (NBD3, 100 Million Won) And Rate of Return (RKOSPI, %)



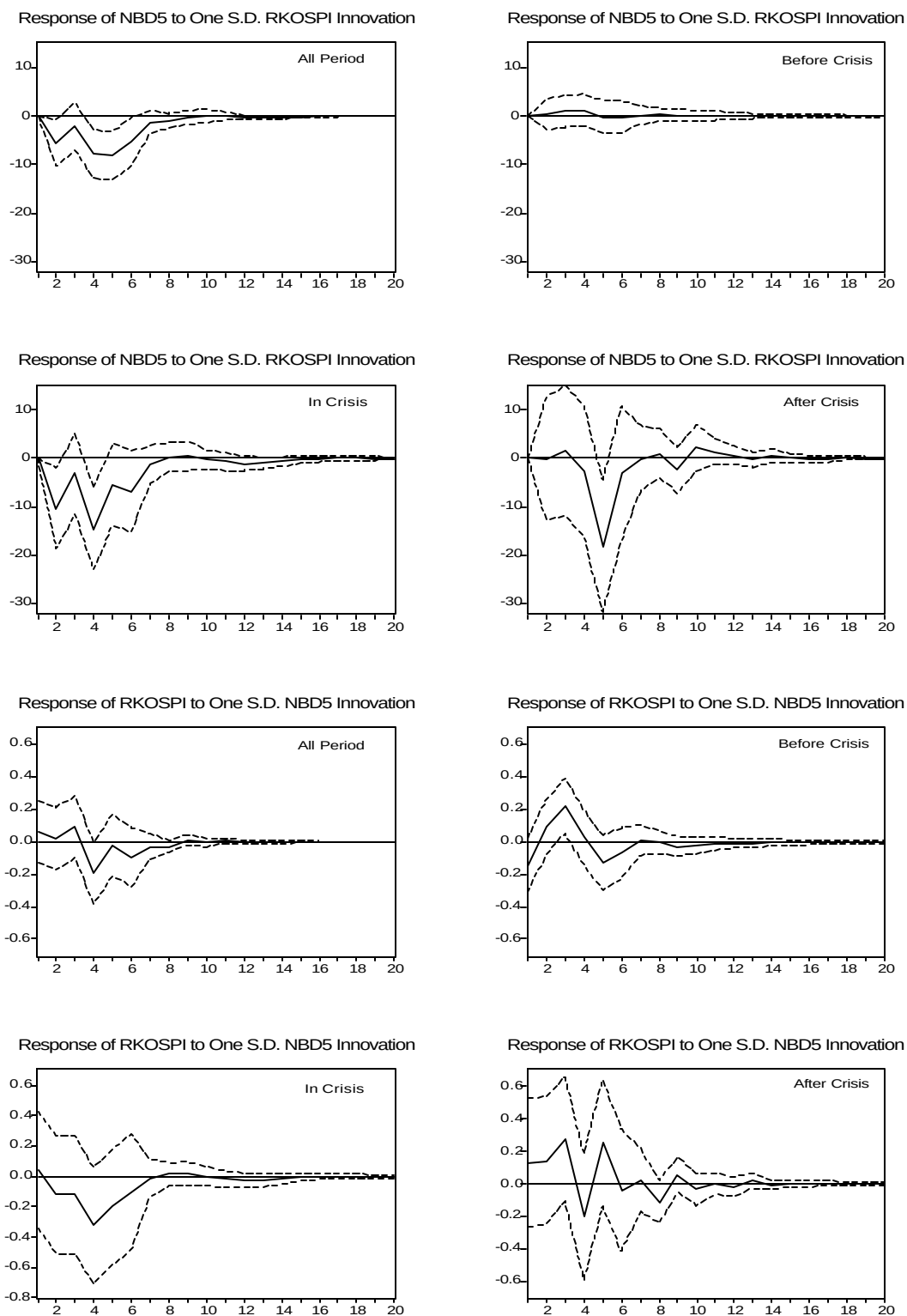
Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 4. Impulse Responses of Net Buys by Banks (NBD4, 100 Million Won) And Rate of Return (RKOSPI, %)



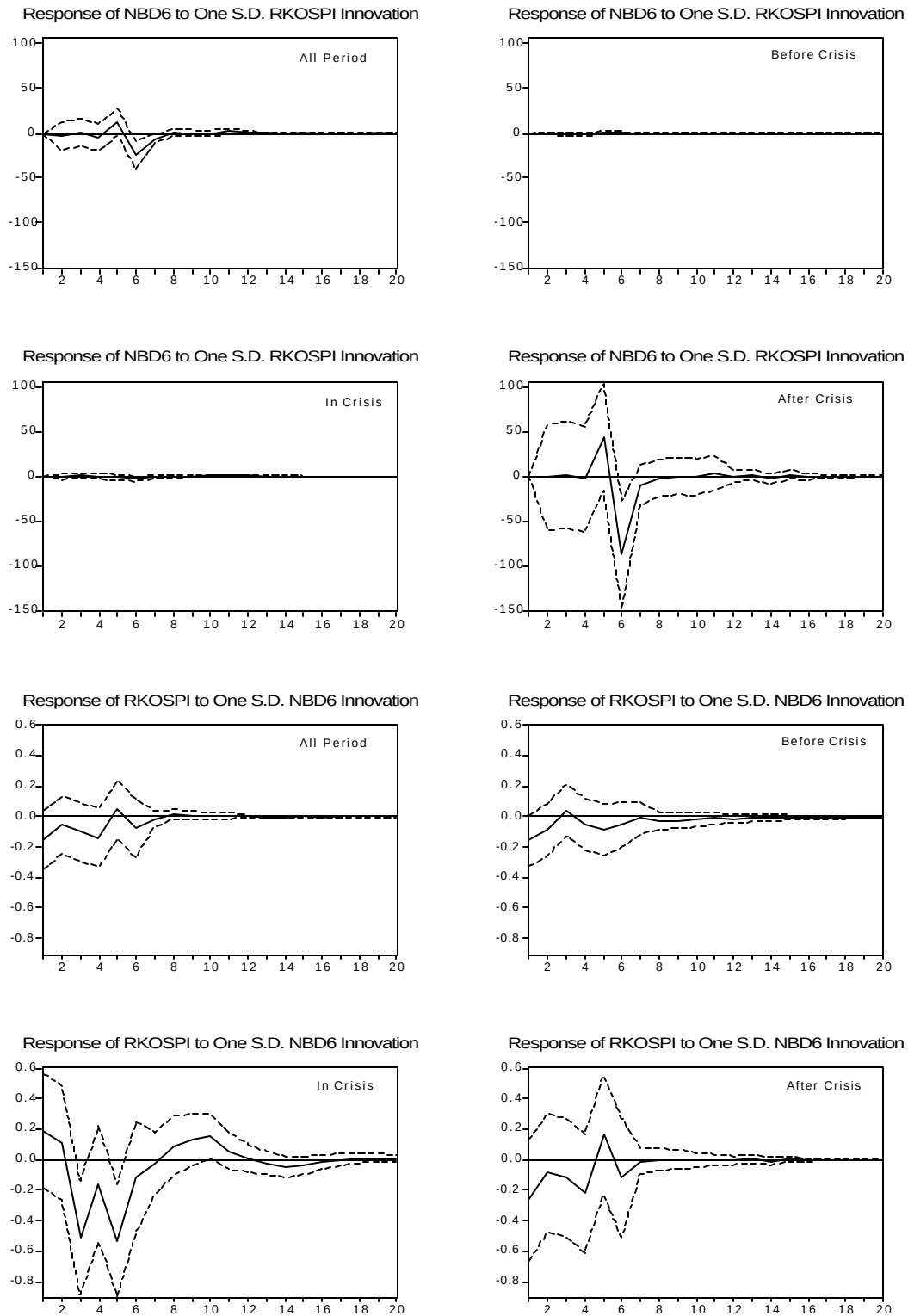
Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 5. Impulse Responses of Net Buys by Merchant Banks and Savings & Finance Companies (NBD5, 100 Million Won) And Rate of Return (RKOSPI, %)



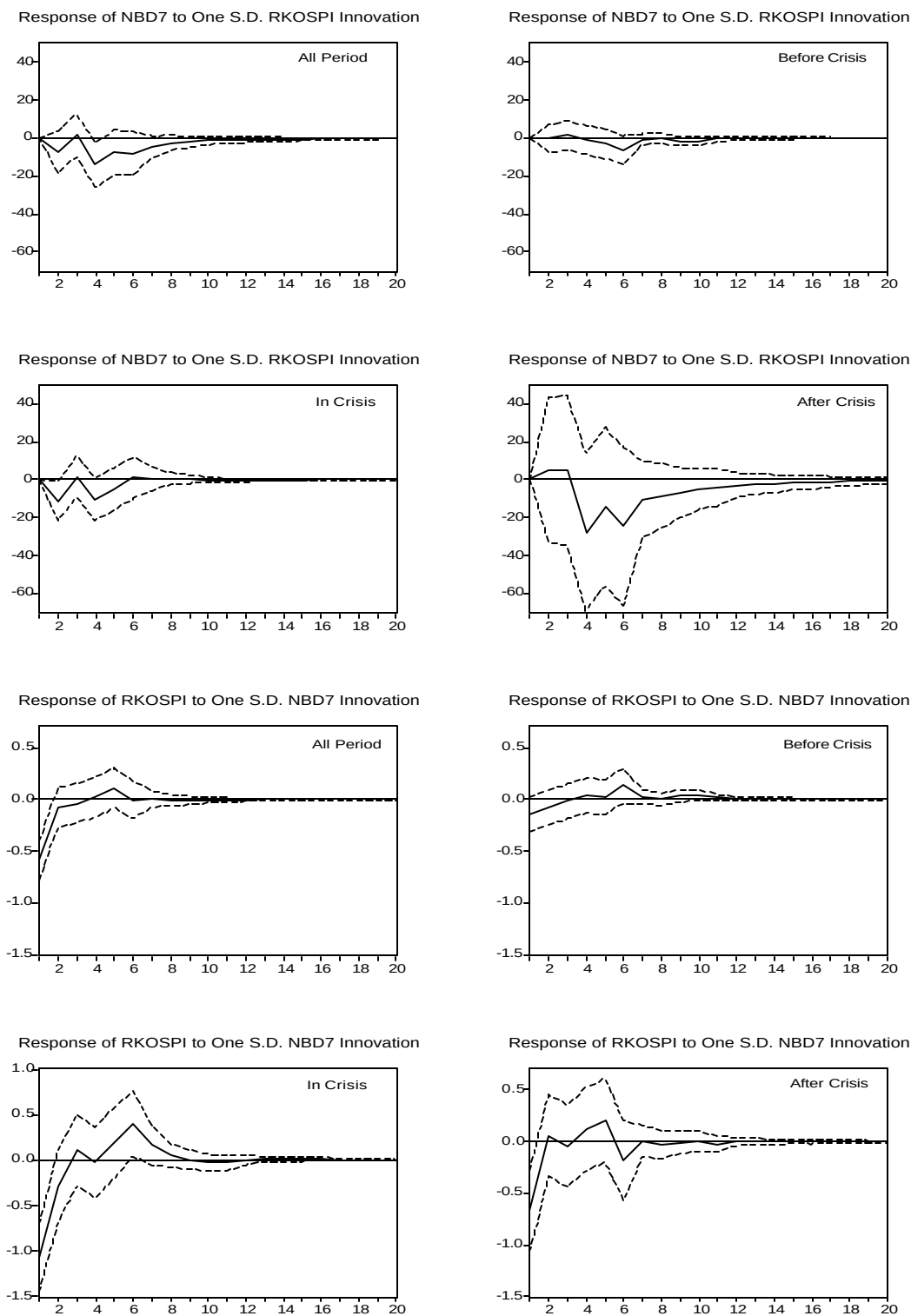
Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 6. Impulse Responses of Net Buys by Mutual Aid Funds (NBD6, 100 Million Won) And Rate of Return (RKOSPI, %)



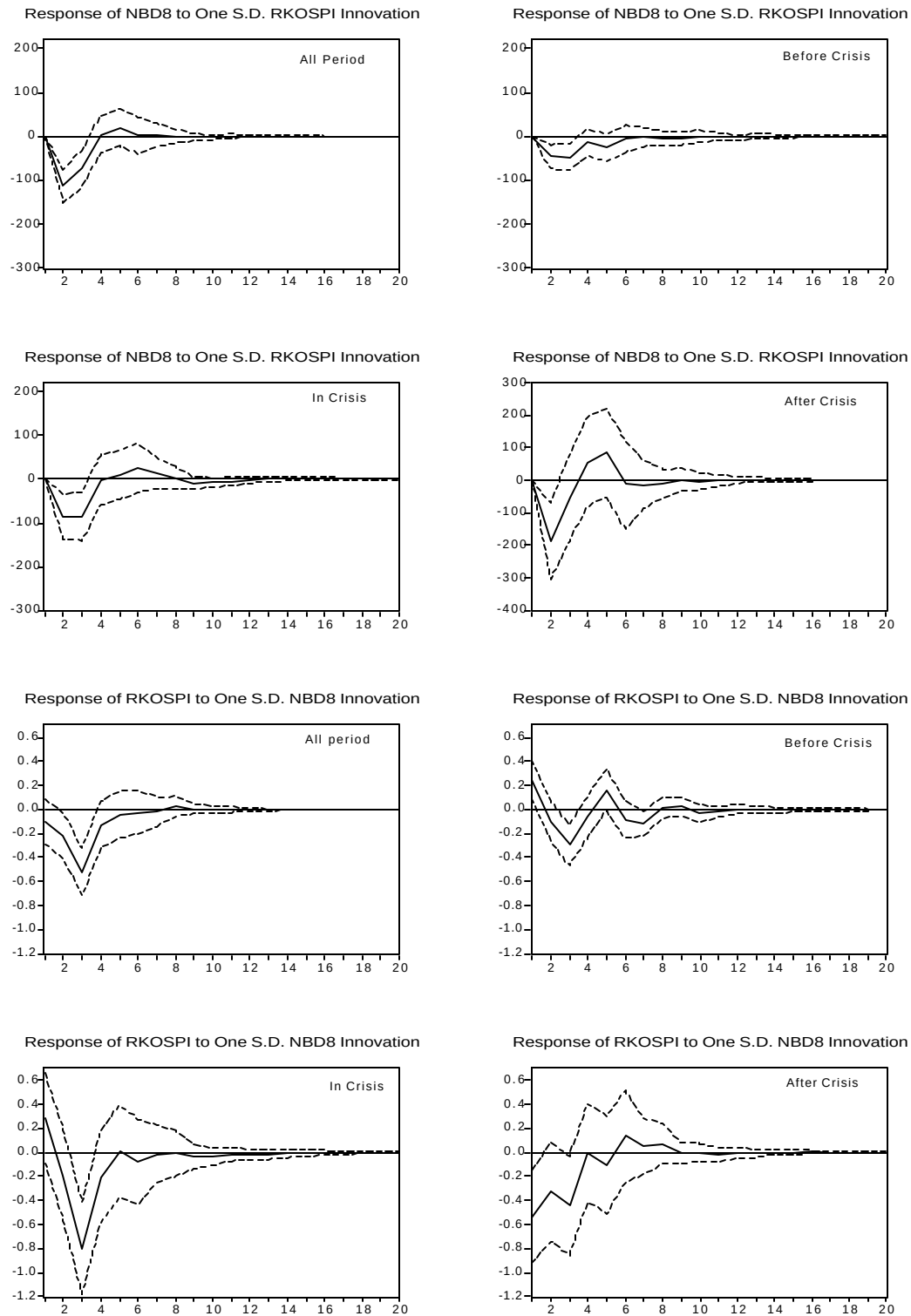
Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 7. Impulse Responses of Net Buys by Government Funded Institutions (NBD7, 100 Million Won) And Rate of Return (RKOSPI, %)



Note: Dotted lines indicate the significance range at the 95% level.

Appendix Figure 8. Impulse Responses of Net Buys by Individual (NBD8, 100 Million Won) And Rate of Return (RKOSPI, %)



Note: Dotted lines indicate the significance range at the 95% level.

Appendix Table 1-1. Capital and Financial Account from 1996 to 1998

Unit: Million US Dollars

	1996	1997	1998	1997.9	1997.10	1997.11	1997.12	1998.1	1998.2	1998.3	1998.4	1998.5
Capital and Financial Account	23,326.8	1,314.4	-3,253.3	446.4	939.3	-4,470.9	-6,415.1	-488.3	-293.2	-220.6	2,385.8	-418.2
I. Financial Account	23,924.4	1,922.0	-3,424.4	497.5	984.5	-4,408.3	-6,359.0	-476.8	-288.8	-212.4	2,422.4	-509.1
1. Direct Investment	-2,344.7	-1,605.2	616.2	-137.4	-102.2	52.9	-162.5	-18.7	-132.3	-183.8	-72.9	331.2
2. Portfolio Investment	15,184.6	14,295.3	-1,878.2	1,949.5	413.7	-815.1	829.6	370.6	2,169.8	1,265.5	3,667.7	-1,200.0
(1) Equity Securities	5,300.8	2,205.5	3,897.8	-503.7	-764.4	-1,074.4	459.7	851.6	1,493.1	545.5	266.0	38.5
(2) Debt Securities	9,883.8	12,089.8	-5,776.0	2,453.2	1,178.1	259.3	369.9	-481.0	676.7	720.0	3,401.7	-1,238.5
3. Other Investment	11,084.5	-10,768.1	-2,162.4	-1,314.6	673.0	-3,646.1	-7,026.1	-828.7	-2,326.3	-1,294.1	-1,172.4	359.7
(1) Loans	13,791.0	-8,081.4	2,096.4	-593.6	257.5	-3,323.2	-7,986.1	-3.6	490.5	373.5	563.3	1,640.6
A. Long-Term	4,502.6	21,517.9	15,579.9	674.5	1,886.9	529.4	14,969.8	2,026.9	1,781.2	1,107.2	6,082.8	555.8
Monetary Authorities	5.2	11,112.1	5,013.3	-0.2	-1.0	-10.5	11,118.5	2,006.1	2,023.9	0.7	-1.3	1,251.0
General Government	-571.9	4,601.3	4,547.5	-24.6	-48.4	-36.1	4,951.8	1,015.5	-12.1	2,031.5	-37.9	58.7
Deposit Money Banks	2,448.2	2,433.1	1,507.2	716.2	1,522.7	382.2	-1,190.1	-1,170.8	-517.1	-1,062.0	3,466.9	-1,555.7
Other Sectors	2,621.1	3,371.4	4,511.9	-16.9	413.6	193.8	89.6	176.1	286.5	137.0	2,655.1	801.8
B. Short-Term	9,288.4	-29,599.3	-13,483.5	-1,268.1	-1,629.4	-3,852.6	-22,955.9	-2,030.5	-1,290.7	-733.7	-5,519.5	1,084.8
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
General Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	3,852.3	-23,258.9	-4,417.1	-638.9	-519.1	-2,396.4	-19,693.5	-914.3	-791.8	-442.5	-2,252.1	1,466.1
Other Sectors	5,436.1	-6,340.4	-9,066.4	-629.2	-1,110.3	-1,456.2	-3,262.4	-1,116.2	-498.9	-291.2	-3,267.4	-381.3
(2) Trade Credits	3,725.0	-5,602.2	-6,180.3	-519.0	-548.1	-919.3	-3,887.2	-2,486.6	-2,624.2	-1,697.8	-947.7	-631.5
A. Long-Term	-148.7	-1,016.4	1,389.7	-119.5	-329.4	-13.0	-648.3	-63.9	-262.2	-103.5	-122.4	6.5
B. Short-Term	3,873.7	-4,585.8	-7,570.0	-399.5	-218.7	-906.3	-3,238.9	-2,422.7	-2,362.0	-1,594.3	-825.3	-638.0
(3) Currency and Deposits	-2,609.4	166.2	1,564.2	-96.2	123.3	-555.2	1,733.5	234.9	-200.3	409.1	-650.6	479.2
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	-979.4	-454.1	695.5	-46.6	390.6	-856.8	579.1	-277.0	-13.5	440.4	-563.7	175.2
Other Sectors	-1,630.0	620.3	868.7	-49.6	-267.3	301.6	1,154.4	511.9	-186.8	-31.3	-86.9	304.0
(4) Other Assets	-3,822.1	2,749.3	357.3	-105.8	840.3	1,151.6	3,113.7	1,426.6	7.7	-378.9	-137.4	-1,128.6
II. Capital Account	-597.6	-607.6	171.1	-51.1	-45.2	-62.6	-56.1	-11.5	-4.4	-8.2	-36.6	90.9

Sources: The Bank of Korea, Monthly Economic Bulletin, Various Issues.
The Bank of Korea, Monthly Balance of Payments, Various Issues.

Appendix Table 1-2. Changes in Assets (Capital Outflows by Domestic Investors from Financial Account)

Unit: Million US Dollars

	1996	1997	1998	1997.9	1997.10	1997.11	1997.12	1998.1	1998.2	1998.3	1998.4	1998.5
Financial Account Outflows	24,155.3	16,009.2	-306.7	-123.5	1,940.9	-2,075.9	6,054.4	-819.9	687.3	1,063.6	911.9	980.7
1. Direct Investment Outflows	4,670.1	4,449.4	4,799.4	180.2	247.8	233.4	549.5	131.1	339.8	368.5	267.4	177.7
2. Portfolio Investment Outflows	5,998.4	-2,008.1	1,586.7	-198.3	301.1	-747.2	-2,067.9	-335.3	-316.2	-562.9	-52.4	692.8
(1) Equity Securities	652.8	319.5	-41.6	22.1	5.1	90.3	-126.8	62.2	-78.4	-120.1	-107.2	41.3
(2) Debt Securities	5,345.6	-2,327.6	1,628.3	-220.4	296.0	-837.5	-1,941.1	-397.5	-237.8	-442.8	54.8	651.5
3. Other Investment Outflows	13,486.8	13,567.9	-6,692.8	-105.4	1,392.0	-1,562.1	7,572.8	-615.7	663.7	1,258.0	696.9	110.2
(1) Loans	5,556.2	11,866.3	-3,604.3	-405.3	539.8	-1,129.1	10,958.0	202.0	64.6	1,044.0	-317.7	-1,055.7
A. Long-Term	295.3	259.1	3,527.5	50.1	11.9	31.1	75.5	188.6	-233.2	449.6	789.5	1,149.2
Monetary Authorities	-5.2	4.9	-0.1	0.2	1.0	10.5	-1.5	-0.5	-0.2	-0.7	1.3	-2.3
General Government	79.3	69.3	80.6	3.9	12.5	3.5	15.6	6.8	-6.4	-25.2	1.3	3.1
Deposit Money Banks	44.2	-47.0	4,173.9	-39.9	0.1	-3.2	61.0	354.7	-130.0	370.5	915.1	1,117.9
Other Sectors	177.0	231.9	-726.9	85.9	-1.7	20.3	0.4	-172.4	-96.6	105.0	-128.2	30.5
B. Short-Term	5,260.9	11,607.2	-7,131.8	-455.4	527.9	-1,160.2	10,882.5	13.4	297.8	594.4	-1,107.2	-2,204.9
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
General Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	3,339.4	11,173.6	-7,833.1	-279.9	436.8	-751.6	11,143.5	-134.6	573.0	510.2	-1,493.8	-1,912.1
Other Sectors	1,921.5	433.6	701.3	-175.5	91.1	-408.6	-261	148.0	-275.2	84.2	386.6	-292.8
(2) Trade Credits	821.5	3,306.2	-915.2	123.3	574.0	422.5	1,879.9	596.3	610.1	295.2	141.5	331.9
A. Long-Term	671.4	1,283.3	-1,352.7	84.3	329.5	21.1	651.5	56.7	264.2	196.8	245.8	63.6
B. Short-Term	150.1	2,022.9	437.5	39.0	244.5	401.4	1,228.4	539.6	345.9	98.4	-104.3	268.3
(3) Currency and Deposits	2,630.8	-762.2	-885.9	-15.4	-89.1	43.0	-2,145.4	-217.8	94.5	-426.5	679.3	-461.9
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	810.9	55.9	-188.5	69.7	-330.2	493.9	-921.5	320.1	-78.5	-411.1	605.8	-123.7
Other Sectors	1,819.9	-818.1	-697.4	-85.1	241.1	-450.9	-1,223.9	-537.9	173.0	-15.4	73.5	-338.2
(4) Other Assets	4,478.3	-842.4	-1,287.4	192.0	367.3	-898.5	-3,119.7	-1,196.2	-105.5	345.3	193.8	1,295.9

Sources: The Bank of Korea, Monthly Economic Bulletin, Various Issues.
The Bank of Korea, Monthly Balance of Payments, Various Issues.

Appendix Table 1-3. Changes in Liabilities (Capital Inflows by Foreign Investors to Financial Account)

Unit: Million US Dollars

	1996	1997	1998	1997.9	1997.10	1997.11	1997.12	1998.1	1998.2	1998.3	1998.4	1998.5
Financial Account Inflows	48,079.7	17,931.2	-3,731.1	374.0	2,925.4	-6,484.2	-304.6	-1,296.7	398.5	851.2	3,334.3	471.6
1. Direct Investment Inflows	2,325.4	2,844.2	5,415.6	42.8	145.6	286.3	387.0	112.4	207.5	184.7	194.5	508.9
2. Portfolio Investment Inflows	21,183.0	12,287.2	-291.5	1,751.2	714.8	-1,562.3	-1,238.3	35.3	1,853.6	702.6	3,615.3	-507.2
(1) Equity Securities	5,953.6	2,525.0	3,856.2	-481.6	-759.3	-984.1	332.9	913.8	1,414.7	425.4	158.8	79.8
(2) Debt Securities	15,229.4	9,762.2	-4,147.7	2,232.8	1,474.1	-578.2	-1,571.2	-878.5	438.9	277.2	3,456.5	-587
3. Other Investment Inflows	24,571.3	2,799.8	-8,855.2	-1,420.0	2,065.0	-5,208.2	546.7	-1,444.4	-1,662.6	-36.1	-475.5	469.9
(1) Loans	19,347.2	3,784.9	-1,507.9	-998.9	797.3	-4,452.3	2,971.9	198.4	555.1	1,417.5	245.6	584.9
A. Long-Term	4,797.9	21,777.0	19,107.4	724.6	1,898.8	560.5	15,045.3	2,215.5	1,548.0	1,556.8	6,872.3	1,705.0
Monetary Authorities	0.0	11,117.0	5,013.2	0.0	0.0	0.0	11,117.0	2,005.6	2,023.7	0.0	0.0	1,248.7
General Government	-492.6	4,670.6	4,628.1	-20.7	-35.9	-32.6	4,967.4	1,022.3	-18.5	2,006.3	-36.6	61.8
Deposit Money Banks	2,492.4	2,386.1	5,681.1	676.3	1,522.8	379.0	-1,129.1	-816.1	-647.1	-691.5	4,382.0	-437.8
Other Sectors	2,798.1	3,603.3	3,785.0	69.0	411.9	214.1	90.0	3.7	189.9	242.0	2,526.9	832.3
B. Short-Term	14,549.3	-17,992.1	-20,615.3	-1,723.5	-1,101.5	-5,012.8	-12,073.4	-2,017.1	-992.9	-139.3	-6,626.7	-1,120.1
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
General Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	7,191.7	-12,085.3	-12,250.2	-918.8	-82.3	-3,148.0	-8,550.0	-1,048.9	-218.8	67.7	-3,745.9	-446
Other Sectors	7,357.6	-5,906.8	-8,365.1	-804.7	-1,019.2	-1,864.8	-3,523.4	-968.2	-774.1	-207.0	-2,880.8	-674.1
(2) Trade Credits	4,546.5	-2,296.0	-7,095.5	-395.7	25.9	-496.8	-2,007.3	-1,890.3	-2,014.1	-1,402.6	-806.2	-299.6
A. Long-Term	522.7	266.9	37.0	-35.2	0.1	8.1	3.2	-7.2	2	93.3	123.4	70.1
B. Short-Term	4,023.8	-2,562.9	-7,132.5	-360.5	25.8	-504.9	-2,010.5	-1,883.1	-2,016.1	-1,495.9	-929.6	-369.7
(3) Currency and Deposits	21.4	-596.0	678.3	-111.6	34.2	-512.2	-411.9	17.1	-105.8	-17.4	28.7	17.3
Monetary Authorities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deposit Money Banks	-168.5	-398.2	507.0	23.1	60.4	-362.9	-342.4	43.1	-92.0	29.3	42.1	51.5
Other Sectors	189.9	-197.8	171.3	-134.7	-26.2	-149.3	-69.5	-26.0	-13.8	-46.7	-13.4	-34.2
(4) Other Assets	656.2	1,906.9	-930.1	86.2	1,207.6	253.1	-6.0	230.4	-97.8	-33.6	56.4	167.3

Sources: The Bank of Korea, Monthly Economic Bulletin, Various Issues.
The Bank of Korea, Monthly Balance of Payments, Various Issues.

Appendix Table 2. Outstanding Foreign Loans to Domestic Financial Institutions by Country of Origin

Unit: Billion US Dollars, %

	1996.12	1997.3	1997.6	1997.9	1997.12	1998.3	1998.6	IV. Total Withdrawal
Total Change*	62.6	59.9	59.0	51.3	31.9	27.1	28.0	
(% Share)		-2.7	-0.9	-7.7	-19.4	-4.8	0.9	-34.6
<% Share>		(7.8)	(2.6)	(22.3)	(56.1)	(13.9)	(-2.6)	(100.0)
		<100.0>	<100.0>	<100.0>	<100.0>	<100.0>	<100.0>	
Japan Change	26.0	21.3	22.1	20.6	14.0	12.6	13.1	
(% Share)		-4.7	0.8	-1.5	-6.6	-1.4	0.5	-12.9
<% Share>		(36.4)	(-6.2)	(11.6)	(51.2)	(10.9)	(-3.9)	(100.0)
		<174.1>	<-88.9>	<19.5>	<34.0>	<29.2>	<55.6>	
Europe Change	18.8	20.5	18.6	17.3	10.7	9.3	9.8	
(% Share)		1.7	-1.9	-1.3	-6.6	-1.4	0.5	-9.0
<% Share>		(-18.9)	(21.1)	(14.4)	(73.3)	(15.6)	(-5.6)	(100.0)
		<-63.0>	<211.1>	<16.9>	<34.0>	<29.2>	<55.6>	
US Change	7.0	8.8	8.6	7.0	4.6	3.6	3.7	
(% Share)		1.8	-0.2	-1.6	-2.4	-1.0	0.1	-3.3
<% Share>		(-54.5)	(6.1)	(48.5)	(72.7)	(30.3)	(-3.0)	(100.0)
		<-66.7>	<22.2>	<20.8>	<12.4>	<20.8>	<11.1>	
Others Change	10.9	9.2	9.7	6.4	2.6	1.6	1.5	
(% Share)		-1.7	0.5	-3.3	-3.8	-1.0	-0.1	-9.4
<% Share>		(18.1)	(-5.3)	(35.1)	(40.4)	(10.6)	(1.1)	(100.0)
		<63.0>	<-55.6>	<42.9>	<19.6>	<20.8>	<-11.1>	

Note: * is close to the sum of changes in loans by deposit money banks and other sectors during the corresponding period in Appendix Table 1-3.

Source: Ministry of Finance and Economy.

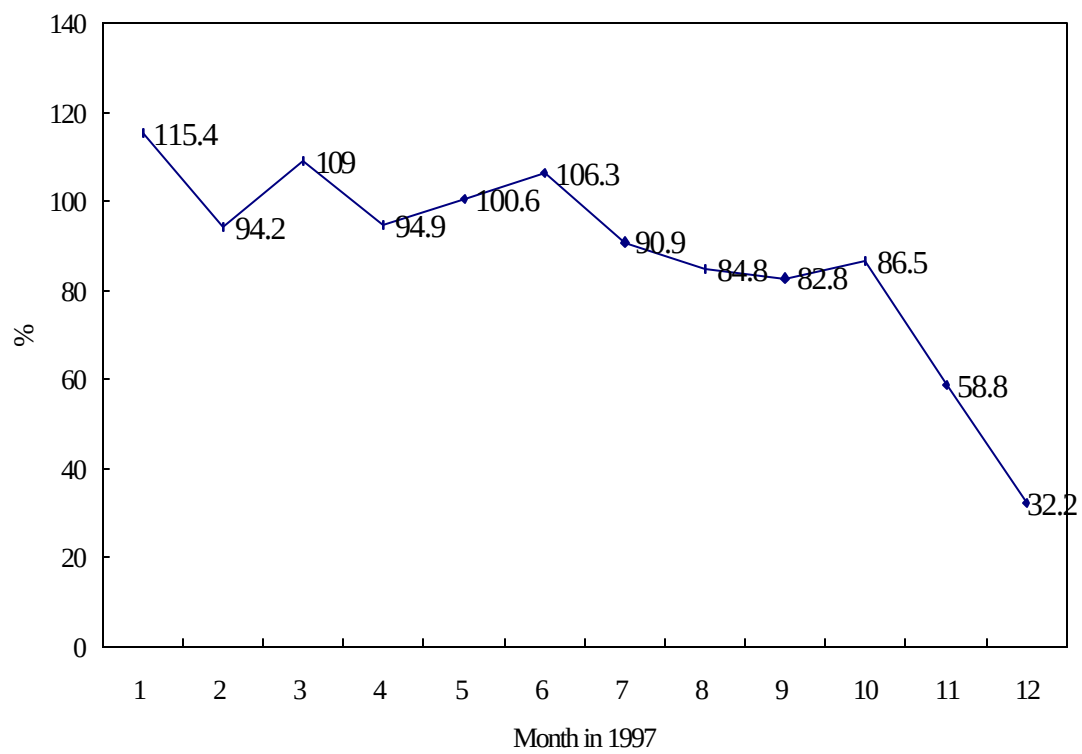
**Appendix Table 3. Term Structure of Fund Management in Merchant Banks
At the end of October 1997**

Unit: Billion US Dollars

	Source of Funds	Use of Funds
Short-Term (Shorter than 1 year)	12.9 (64.4%)	3.2 (16.3%)
Long-Term (Longer than 1 year)	7.1 (35.6%)	16.8 (83.7%)
Total	20.0 (100.0%)	20.0 (100.0%)

Source: Ministry of Finance and Economy.

**Appendix Figure 9. Roll-over Rates of Short-term Credit
To Korean Foreign Exchange Banks in 1997**



Appendix Table 4. Assets and Liabilities of Domestic Foreign Exchange Banks in Korea

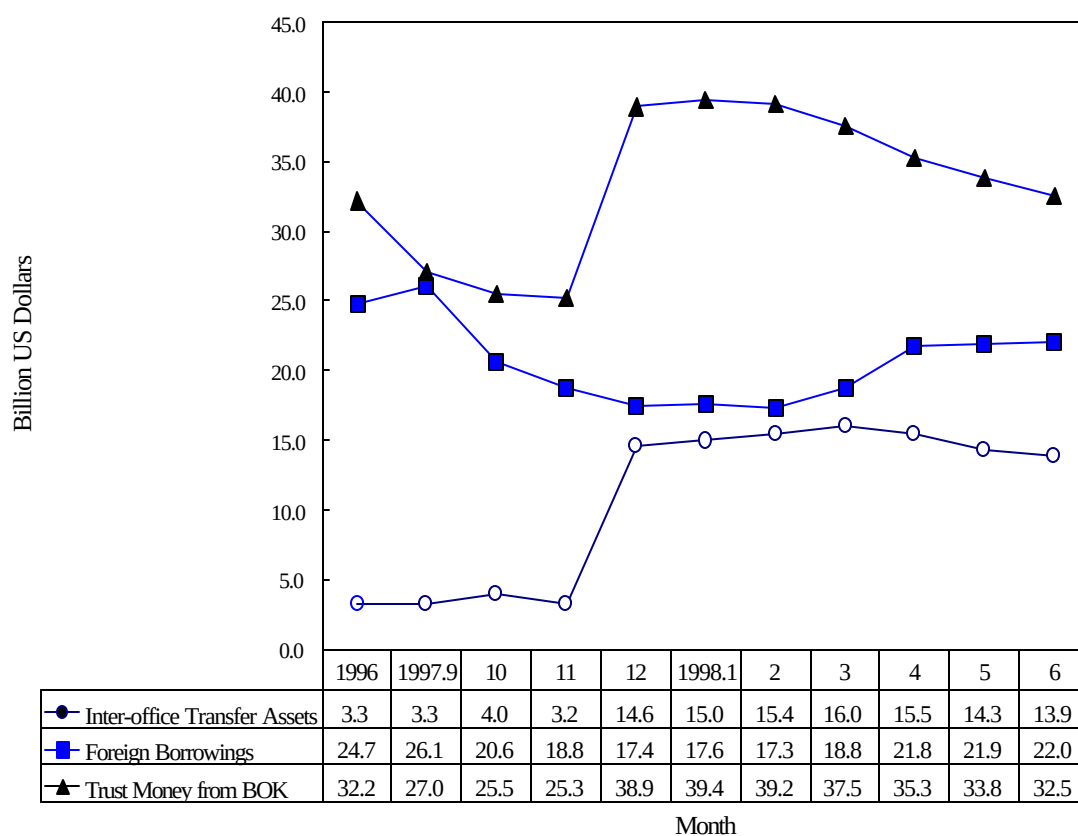
Unit: 100 Million US Dollars, %

	1993		1994		1995		1996		1997	
	Value	(%)	Value	(%)	Value	(%)	Value	(%)	Value	(%)
Foreign Assets	507.2	100.0	641.0	100.0	838.5	100.0	1001.8	100.0	1121.3	100.0
External Assets	161.6	31.9	209.3	32.7	275.4	32.8	354.2	35.4	440.9	39.3
Due from Banks	18.0	3.5	21.2	3.3	25.1	3.0	26.6	2.7	39.5	3.5
Securities	13.2	2.6	23.0	3.6	27.2	3.2	53.4	5.3	38.6	3.4
Drafts bought	90.8	17.9	121.9	19.0	164.2	19.6	201.2	20.1	158.0	14.1
Call Loan	1.0	0.2	0.6	0.1	1.3	0.2	1.0	0.1	8.5	0.8
Loans & Discounts	6.7	1.3	7.3	1.1	9.1	1.1	11.2	1.1	14.6	1.3
Inter-office	20.3	4.0	19.5	3.0	24.1	2.9	32.7	3.3	141.1	12.6
Investment	4.6	0.9	5.3	0.8	7.1	0.8	7.7	0.8	8.1	0.7
Others	5.4	1.1	8.1	1.3	13.4	1.6	15.9	1.6	27.6	2.5
Internal Assets	272.9	53.8	346.6	54.1	459.2	54.8	534.2	53.3	568.2	50.7
Due from Banks	20.1	4.0	24.8	3.9	32.5	3.9	42.2	4.2	60.1	5.4
Loans & Discounts	199.4	39.3	252.6	39.4	318.2	38.0	362.3	36.2	350.6	31.3
Usance	0.6	0.1	2.2	0.3	2.8	0.3	5.4	0.5	2.7	0.2
Securities	6.6	1.3	11.1	1.7	16.8	2.0	17.1	1.7	17.9	1.6
Call Loan	3.9	0.8	3.6	0.6	6.8	0.8	10.8	1.1	33.6	3.0
Others	41.8	8.2	52.3	8.2	82.0	9.8	96.5	9.6	103.3	9.2
Position	72.7	14.3	85.1	13.3	103.7	12.4	113.4	11.3	112.2	10.0
Foreign Liabilities	507.2	100.0	641.0	100.0	838.5	100.0	1001.8	100.0	1121.3	100.0
External Liabilities	165.3	32.6	233.2	36.4	366.4	43.7	499.8	49.9	446.8	39.8
Due from Banks	1.1	0.2	0.8	0.1	1.4	0.2	1.8	0.2	2.5	0.2
Call Money	5.0	1.0	10.6	1.7	18.4	2.2	23.8	2.4	7.9	0.7
Borrowings	82.5	16.3	121.5	18.9	192.9	23.0	247.4	24.7	151.1	13.5
(Bank Loan)	37.2	7.3	32.0	5.0	27.8	3.3	14.0	1.4	16.1	1.4
(Others)	13.1	2.6	20.1	3.1	63.3	7.5	120.4	12.0	117.9	10.5
Bonds Issued	73.7	14.5	94.3	14.7	148.2	17.7	222.6	22.2	269.8	24.1
Inter-office	1.6	0.3	2.4	0.4	3.7	0.4	2.2	0.2	4.6	0.4
Others	1.4	0.3	1.5	0.2	1.9	0.2	2.1	0.2	6.3	0.6
Internal Liabilities	340.1	67.1	404.1	63.0	465.6	55.5	488.2	48.7	631.1	56.3
Resident's Deposit	7.5	1.5	5.9	0.9	7.5	0.9	14.4	1.4	40.6	3.6
Trust Money from BOK	253.7	50.0	299.7	46.8	334.1	39.8	321.7	32.1	389.0	34.7
Call money	13.9	2.7	12.9	2.0	18.0	2.2	19.6	2.0	65.6	5.9
Borrowings	55.3	10.9	71.8	11.2	91.4	10.9	115.3	11.5	115.4	10.3
Others	9.7	1.9	13.8	2.2	14.6	1.7	17.3	1.7	20.5	1.8
Position	1.8	0.3	3.7	0.6	6.4	0.8	13.7	1.4	43.4	3.9

Note: Exclusion of offshore foreign assets, liabilities, and acceptances & guarantees.

Source: The Bank of Korea.

Appendix Figure 10. Inter-office Transfer Assets, Borrowings, and Trust Money from BOK in Domestic Foreign Exchange Banks' Balance Sheet



Source: The Bank of Korea.

Appendix Figure 11. Net Short-term Capital Inflows to Korean Foreign Exchange Banks

